FOSS © FOOD AND NUTRITION
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 to 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>
Food is a complex and varied array of nutrients for maintaining life. The process of delivering nutrients to where they are needed and used is called nutrition. Scientists divide the nutrients in foods into several categories. Three of the categories are explored in this module. Students test a variety of foods for fat, sugar and acid content. They apply their understanding to food chemistry to make wise choices about the foods they eat.

<Sheila Dunston Introduction to Module>
Narrator: Hi I'm Sheila Dunston. I'm here to help you get started with your Foss Food and Nutrition kit. The FOSS Food and Nutrition module consist of four investigations that help children understand what food is made of and how several nutrient groups contribute to good nutrition. Most of the equipment you will need to teach this module comes in the kit.

Everything you see here comes in these two boxes. There is enough permanent equipment in the kit for a class of 32 students and enough consumable equipment for at least two classes. You will need to check the inventory sheet and the Materials folio to see which materials are considered consumable and which are permanent.

These are the materials you'll need from the FOSS measurement toolkit. I'll go over what you'll need for each part when we come to it. And you'll need to supply these common classroom materials. In addition you'll need an assortment of packaged and fresh food samples to use with

this module. You may want to work out a plan with your students who is going to bring in which samples on the days that you'll need them.

Before you begin teaching this module, it's very important that you read the entire Teacher's Guide. Don't make the common mistake of thinking everything you need comes from the video because there's tons of details included in the Teacher's Guide that we could not put in the video.

The first thing you'll find in the Teacher's Guide is the Overview folio, which points out national standards addressed in this module, as well as information about how to make best use of the Teacher's Guide. It also includes valuable background information specially written for teachers who have not have extensive science background. The suggested teaching schedule in the overview will be particularly helpful as you plan.

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 called Preparing Your Kit for Your Classroom. Both of these sections will give you helpful hints that will save you lots of preparation time later.

The next four folios 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. There is a section called Teaching Children About which gives you some insight into research about how children think and learn. Each investigation has several parts. 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 are 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 Letter 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 with their children.

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 or portfolio assembly. The folio contains scoring guides for each of the assessments suggested.

Next are the assessment duplication masters. Here you'll find all the masters for the assessment charts and End-Of-Module Assessments. As part of the kit, there are Science Stories for the students to read. The Science Stories folio gives you background information, recommends when to read the stories and suggests follow-up activities. You may want to read the Science Stories during a reading period rather than science time, especially if you only teach science a couple of times a week.

In the Resource folio you will find lists of trade books, videos, computer software and other

resources that you can use to enrich the program. The final tab is the FOSS website folio. On the website you'll find simulations, graphics, text materials and activities that support and extend this module. The 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 resources for teachers.

Now you're ready to begin.

<Investigation 1, Part 1>
Narrator: This investigation begins with students setting up a test to determine the amount of fat in different foods. For each session you'll want to set up a Materials Station. This will help with the distribution of materials. Here is what you will need for this part: From the kit: Droppers, wax papers, steel spoons, cardboard trays, large brown paper, circle template, permanent marker, small brown paper, small plastic squares, and plastic cups. From the measurement kit: The gram pieces and the balances.

You'll need to provide transparent tape, lined paper, paper towels, facial tissues, stapler and 16 food samples. Many of these food samples can be acquired by bringing in single serving portions from takeout restaurants. Duplicate the student sheet called Journal Cover and make one copy of the Assessment Chart For Investigation 1.

So how do you know this is all working for your students? Assessment opportunities are embedded throughout the module. In the Getting Ready section there's a note on assessment along with an Assessment folio where you can make selections of the best assessment tools to use for your students.

Each team will need five of the brown paper squares that come in the kit. You will need to use the circle template to draw a circle in about 50 of these sheets using a permanent marker. Draw a circle on one large brown sheet of paper, which we'll use for a demonstration. Cut nine pieces of wax paper and tape them to the tray. Make two copies of the Food Labels sheet, cut them apart and place them into the hat. Each group will draw four names that will determine which foods they test.

The students will tape these labels to their brown paper after they place the food in the circle. At the fifth and sixth grade level it's a good idea to teach students to keep careful notes in a journal. Prepare a Food and Nutrition Journal for each student by stapling ten pages of lined paper to the journal cover that you duplicated. You'll need to prepare a Word Bank chart and content inquiry charts using large sheets of paper or a flip chart.

Make a Project Folder for the class. As students think of ideas for projects during the investigations, ask them to write them down and put them in the folder to choose from at the end of the module. This session begins with the teacher leading a discussion with the class about foods.

Teacher: Today we're going to begin the unit on food and nutrition. And I want to start out with the question: Why do we eat?
Chris?

Student: Energy.

Teacher: Energy. And what do we do with that energy?
Nick?

Narrator: Ideas students come up with include that we eat to get energy to move, to think and to keep our bodies running.

Teacher: Okay.

Narrator: The teacher asks the students where foods come from. It's not unusual to get an initial response of the grocery store. With some additional questioning --

Teacher: Where does the food come from, Jessica?

Student: Well, some food comes from like the ground and the soil and others come from animals like the meat that we eat.

Teacher: Very good.

Narrator: The teacher explains that food is made from six groups of chemicals called nutrients. They are protein, carbohydrate, fats, minerals and water. She explains that it's the nutrients in foods that provide the energy and building blocks we need to stay alive.

Teacher: Today we'll be doing an investigation on one of these nutrients. And that's fat.

Narrator: The teacher introduces the brown paper with the circle as a tool to indicate fat in some foods. To standardize the process, the same amount of food will be used in each test. The amount is one gram. To measure that, we use the FOSS balance.

The teacher shows the students how to place the food on the brown paper. To standardize the process, the food must fit inside the circle. If it's a soft food like peanut butter, the students can just smear it around with a craft stick and make sure it all ends up on the paper. If it's a hard food like a cracker, the student covers it with a plastic overlay and generally crushes the sample with a spoon. It's important that all of the food sample stays in the circle. The teacher goes to the food station and identifies each food.

Teacher: We have apples. And we have cut it already into some chunks. But you will probably have to try to break it apart to get only one gram of this piece of apple. But that should be easy because we've already cut it for you.
Ketchup --

Narrator: The teacher has placed the food labels in a basket. Each reporter chooses four labels for their group. Getters 1 come to the Materials Station to get the equipment their group needs. The starter zeros the balance. Getters 2 go to the food station with their trays to get the four food samples for their groups. They use craft sticks to portion out the jelly, cream cheese, margarine and peanut butter.

Student: No. A little more. Wait.

Student: A little more.

Student: It's level; it's level.

Narrator: This student is using a craft stick to spread the margarine in the circle. This student is using her fingers and metal spoon to smash one gram of potato chip onto the paper. She scrapes the residue from the piece of plastic and makes sure all of the chip is inside the circle.

The students tape the food labels to their papers and then place these on the tray which is covered with wax paper. To make sure the samples remain in place, have the students tape the brown paper squares to the wax paper.

The teacher creates a sample of pure fat for the class. She places 35 drops of salad oil, the equivalent of one gram, on a large piece of brown paper with a circle. The class will be able to use this as a measure to compare their results to in two days. The teacher explains that wet looking spots can result from fats or from water on the paper so they will wait two days to see if the wetness dries up.

Water will dry up. Fat will not. She directs the reporter to tape the groups' names to the trays. After the students recall their new words from the Word Bank, the teacher asks questions to help students formulate concept statements for this part.

Teacher: We learned that brown paper can be a way to figure out how much fat is in a food. It's an indicator because the fat will spread out onto the brown paper. So the first thing we learned is that brown paper --

Narrator: In this part, students learn brown paper can be used as an indicator to test foods for fat content. Be sure to check the Science Stories folio and plan time for the students to read the stories.

<Investigation 1, Part 2>

Narrator: In Part 2 of this investigation, the students measure the size of the grease spots to determine the amount of fat in the different foods. Here is what you'll need for this part: from the kit, centimeter grid transparencies, cardboard trays with food samples from Part 1. You'll need to supply paper towels, watercolor markers or transparency pens if you have them.

You'll need to make copies of the student sheet called the Fat Test and the student sheet called Response Sheet - The Fat Test, which you can use for assessment. Consult the assessment folio for details. Have Assessment Chart For Investigation 1 available so you can make notes as you work with the students.

Begin this session by asking the students to study their fat test samples. Here is what they look like after two days. The getters take them back to their groups.

Student: None.

Student: No, it did. It has a little bit.

Student: Not much, though.

Student: Okay.

Teacher: On the samples that you have, if there's a ring that has spread out or there is what looks like a greasy spot that has spread out on your paper, that shows you that there's fat. And it's the way that we can measure how much fat there is in the food that we looked at.

Narrator: The teacher shows the students the transparent centimeter grid that can be used to estimate the number of square centimeters occupied by each spot. The teacher introduces the student sheet. She shows them the section of the sheet to use for this part.

One group will measure the size of the pure grease spot produced by the salad oil on the large paper. Later the students will add this sheet to their journals. If you have transparency pens or watercolor markers, students can use them to help keep track of squares as they count them. This is especially helpful with large spots. Make sure they are watercolor pens so the grids can be easily cleaned after the activity.

The student will need to clean the grid after measuring each spot so the next student has a clean grid for the next sample. After the students have measured their grease spots, the teacher uses this chart to record the data the students collected.

Student: We had walnut, which was 30 centimeters. Yes, Natalie, you have a question?

Student: Yes. I want to know how much a pancake has, how much grease it has.

Teacher: I don't know. That's a good thing to put in the project file. Okay. Let's look at our samples. Because we now want to rank them in order from the most fat to the least. So let's figure out which order they go in. No. 1 obviously is cooking oil.

Narrator: The students are now challenged to rank all of the foods in order of fat content starting with the food with the highest fat content. The students work together as a group and record the data on their student sheets in order of fat content. The math problem of the week challenges the students to calculate the percentage of fat in the foods they investigated.

In this part, students should learn the food that produces the largest grease spot has the most fat. Before ending this session, introduce the Project Folder. Explain that at the end of the module students will select projects that they would like to study and learn more about. This is a good time for students to start putting their questions and ideas into the Project Folder.

This brings us to the end of Investigation 1. Be sure to have your students clean up. Select some interdisciplinary activities for your students.

<Investigation 2, Part 1>

Narrator: In the first part of this investigation, students find out that yeast is an indicator for sugar and foods. Here is what you'll need for this part: From the kit: Half liter containers,

plastic cups, five milliliter measuring spoons, syringes, permanent marker, plastic zip bags, yeast and volume tubes.

From the measurement kit you'll need thermometers, plastic liter containers and plastic pitchers. You will need to provide the Food and Nutrition Journals, about a cup of sugar, flour, animal crackers, paper towels and a source for hot water. You will need to make copies of the student sheet called Cookie Labels. Make a copy of the Assessment Chart For Investigation 2, which you should keep with you so you can make notes about how your students are working.

This is the syringe the students will use. You pull out on the plunger. You'll notice that there are notches along the edge. Place your finger here and press down. It will stop it right at 50 milliliters. Let's put it in the water, pull up to fill the barrel and then put your finger right at the first notch. Push down and you have measured 50 milliliters of water.

Now let me show you how to use the volume tube. With the plastic zip bag, add 50 milliliters of water. Press to make sure that all of the air is out of the bag. Zip it shut. Place the bag in the volume tube. Place the piston in next followed by the cover. Okay. Now press down to measure the volume. You might want to review with your students how to read a thermometer, how to go to the top of the red line and to match that to get a reading.

You will find two packs of dry yeast in the kit. Moisture is yeast's greatest enemy. Yeast is a living organism. It will die if it gets too hot or moist. Be sure to keep bags tightly closed and stored in a sealed zip bag.

When you begin this lesson do not reveal that the students will be testing for sugar. The teacher tells the class that yeast is a dormant living organism and then asks: What do you think is needed for yeast to become active?

Teacher: Right now it doesn't look like it could do much of anything because it's dormant. That means it's resting. What do you think we need in order for it to become active?
Vanessa?

Student: Water.

Teacher: Yes.

Narrator: The teacher explains that yeast needs water, warmth and food in order to become active. The getters go to the Materials Station and get two one-liter zip bags in each of which they place two five-milliliter spoons of yeast. They also get a syringe and a liter container half filled with hot water. Using a permanent marker they label one bag Cookie.

After using the syringe to add 50 milliliters of water to a bag with no label, the students press the air out of the bag and seal it. Then the students measure another 50 milliliters of water and squirt it into the bag called Cookie. They place two animal cookies in the bag, press out the air and seal it. They crunch the cookies.

The students place both bags in the warm bath. They will need to use a thermometer to monitor the temperature. When the temperature falls below 35 degrees Celsius, more hot water needs to

be added.
Consider what might work best in your classroom. Have the students get more water or have an adult take the water to the students.

While the bags are in the hot water, the students work on the sheets called Cookie Labels. After ten minutes the teacher asks the students to remove the bags from the warm water bath and observe any changes.

Teacher: Observe what you see has happened as they have been sitting in that warm water bath. What did you guys notice happened?

Student: There's bubbles.

Student: There's bubbles but not much air in this one.

Teacher: Which bag -- what's the difference between these two bags?

Student: That one just had two cookies in it and this one just had the yeast and the water.

Teacher: Just the yeast and the water and that one didn't have much air in it but the cookie bag has some air, doesn't it?

Student: Yeah.

Teacher: Interesting. Did you write that down in your journal, your observations?

As you notice, one of the bags had air in it. It was kind of getting poofy.

Narrator: After the students report that the cookie bags have puffed up, the teacher explains the bubbles and gas in the bag with the food are evidence that the yeast is alive and metabolizing. Metabolism is the process of using food to produce energy to keep organisms alive and functioning. The teacher asks the students to look at their student sheets and find the two main ingredients in cookies.

Teacher: Where it shows the list of ingredients.

Student: Wheat flour and sugar.

Narrator: Now the students need to find out whether it's the flour or the sugar that the yeast is metabolizing. Half of the groups add one level spoon of flour to their no cookie bags. And half of the groups add one level spoonful of sugar to their no cookie bags and put them in the warm bath for ten minutes. The students continue to monitor the temperature.

While the bags are in the bath, the teacher tells the students that the gas made by the yeast in the cookie bag is carbon dioxide or CO_2, the same gas we exhale when we metabolize. The amount of CO_2 that forms in the bags is an indication of the amount of metabolism that is taking place. The teacher goes on to introduce the volume tube as a tool to measure the amount of CO_2 produced. He will demonstrate how to use the volume tube using a bag with only 50 milliliters

of water in it.

The students practice using the volume tube with their cookie bag. The students with flour in their bags found there's little or no gas in their bags. This bag is so full, the students are having a hard time getting it to fit into the tube. If they work the bag very carefully, most students can get it into the tube to measure the gas. If they cannot get the bag into the tube, they will record 600 plus milliliters as the volume.

Student: We had flour. And we got 0.

Teacher: Okay.

Narrator: The teacher records the data given by the recorders on the board. It's easy to analyze these results because they are so consistent. The teacher asks the students if it is the flour or the sugar that yeast metabolizes. The students report that based on the test results, it is sugar that yeast uses for food. The teacher goes on to explain that in the short term, yeast uses sugar and only sugar as a food source. So if yeast is put into a bag with an unknown material and a mixture starts to bubble, they know that the unknown material contains sugar. Yeast can, therefore, be used as an indicator of the presence of sugar. An indicator is an object, material or organism that tells you if a specific substance is present.

In this part, students should remember that yeast can be used as an indicator for the presence of sugar in foods. Plan to have the students do the reading activities from the FOSS Science Stories while doing the investigations.

<Investigation 2, Part 2>

Narrator: In this part, students use yeast as an indicator to test breakfast cereals for sugar. Here is what you'll need for this part: From the kit: Half liter containers, plastic cups, five milliliter measuring spoons, syringes, permanent marker, plastic zip bags, yeast and volume tubes. From the measurement kit you'll need balances, gram pieces, thermometers, plastic liter containers and plastic pitchers.

You will need to provide the Food and Nutrition Journals, paper towels, eight to ten different breakfast cereals. But you'll only need a half a cup of each. You might ask the students to bring in their favorites. You'll need hot water for this part.

You will need to provide the student sheet called Sugar Test. You'll need to duplicate the student sheet called Response Sheet - The Sugar Test, which you can use for assessment. Have Assessment Chart For Investigation 2 available.

In this part, students will be working with breakfast cereals. Consider some children may be hungry so establish rules for sampling the food samples. Remember, some students are on restricted diets and sugar free diets. Make sure you find out before you have them taste any of the food samples.

Begin this session by showing the students the collection of breakfast cereals and go on to ask the students if they can tell whether the cereals contain sugar.

Teacher: Okay. This morning we have a couple of different cereals that we want to test to see if one has more sugar than the other. What are some ways that you might be able to tell if something has sugar in it?
Brian?

Student: It's sweet.

Student: What we could do is we could put yeast and water in two bags and then put one type of cereal in one bag and put the other type of cereal in the other bag and see which bag puffs up more. And the bag that puffs up more should have more sugar in the cereal.

Narrator: After the teacher reviews the sugar test, the getters get two zip bags and put two level spoonfuls of yeast in each. They also take the student sheets and choose two labeled cups of cereal from the food station. Getters No. 2 get the equipment they will need for this test at the Materials Station.

Each bag needs to be labeled with a permanent marker so that later the cereal can be identified. It is important that the students use exactly the same amount of cereal in each bag for the test to be valid. They use the balance to measure three grams of each cereal.

Student: Squeeze the air out.

Student: Squeeze the air out.

Narrator: After checking the temperature of the warm bath, the students place the bags in the water. They will monitor the temperature for ten minutes keeping it between 40 and 50 degrees Celsius.

Student: What's the temperature at?

Student: What's happening?

Student: 36.

Narrator: The teacher circulates from group to group assessing how the students are working. The students work on their student sheets. They will add them to their journals later. The students put their bags into the bath and continue the test for ten more minutes.

Student: 400, 500.

Teacher: Is that higher than last time?

Student: Yeah, a lot. Yeah, last time it was 370.

Teacher: What can you tell between the Fruit Loops and Frosted Flakes? Which one had the most sugar in it?

Student: I think the Frosted Flakes.

Teacher: Why do you say the Frosted Flakes?

Student: Yeah, because they have a higher CO2.

Student: Yeah, it was 500.

Teacher: Okay. Table 1, let's get your first cereal and the ten-minute measurement.

Student: Fruit Loops. They are 300 milliliters. And 450 milliliters.

Student: And for our second one, Frosted Flakes, it was the first ten minutes 370 milliliters. And for the first 20 minutes it was 500.

Teacher: As you can see, the data after waiting just ten more minutes, some of the cereals increased. Some of them were the same.

Narrator: The teacher introduces the word carbohydrates and tells the students that carbohydrates are a group of nutrients that provide energy. Sugars and starches are carbohydrates. He points out the nutritional information for two make-believe cereals on their Sugar Test Student Sheet. The teacher asks the students which cereal has the most sugar, reminding them that the more CO2, the more sugar. Then he asks them to rank the cereals on their sheets from most sugar to least.

In this part, students should remember that the greater the amount of CO2 produced by yeast in a food sample, the greater amount of sugar in the sample. Encourage students to add questions and ideas to the Project Folder.

<Investigation 2, Part 3>

Narrator: In this part, students test a wide variety of foods for sugar. Here is what you'll need for this part: From the kit: Half liter containers, plastic cups, five milliliter measuring spoons, syringes, permanent marker, plastic zip bags, yeast and volume tubes. From the measurement kit you'll need balances, gram pieces, thermometers, plastic liter containers and plastic pitchers.

You will need to provide the Food and Nutrition Journals, paper towels and a wide variety of food samples. Students should bring in samples for the whole class to share.

A day or two before conducting Part 3, hold a discussion with the students to identify interesting foods to test. Cookies, cakes, crackers, donuts, ketchup, jelly, sugar substitutes and lunch items are among the foods that are fun to test. You'll need a source of hot water. You will need to provide the student sheet called Sugar Test. Have Assessment Chart For Investigation 2 available.

This part is a performance assessment. Look over the assessment opportunities described in the Investigations folio. Begin this session by showing the students the display of foods at the food station and reviewing the sugar test. The bags are labeled using permanent markers. Three grams of the samples are weighed.

The water and food samples are added to the bags. The students remember to press the air out of the bags before sealing. The bags are placed in their warm bath and the students monitor the water temperature.

Student: Ten minutes is up.

Student: About 250; 250.

Student: Okay. Going back in the Jacuzzi.

Student: I'm going to get hot water.

Student: It's closed.

Student: You did it last time.

Student: That's all.

Student: Yeah, it's 450.

Student: 450.

Student: Yeah.

Student: Yeah, 450.

Narrator: When all of the results are collected, the teacher asks the students to rank the food items from highest to lowest sugar content. When there are discrepancies in the data, the teacher asks what might have caused the discrepancies. Some possibilities are that the water temperature was not maintained, the food, water and yeast may not have been measured accurately or some gas may have escaped from the bag.

The teacher asks how the students might explain the production of gas in the flour bag after one hour. The reason: That flour contains starch which breaks down into sugar after the water is added. But this takes up to an hour to happen. In this part, the students have the opportunity to investigate a wider selection of foods. They found again that sugar can be present in other foods besides breakfast cereals.

This brings us to the end of Investigation 2. Be sure to select some of the interdisciplinary activities and have your students complete the math problem of the week.

<Investigation 3, Part 1>

Narrator: In this part, students find that baking soda is an indicator for the presence of acid. Here is what you'll need for this part: From the kit: Baking soda, plastic cups, half liter containers, one milliliter spoons, syringes, sticky labels, blue recording dots, reaction bottles, silicon spray. And from the measurement kit: One liter containers. You'll need to provide the Food and Nutrition Journals, vinegar, paper towels and water.

You'll need to copy the student sheet called Acid Test. Make one copy of the Assessment Chart For Investigation 3. You'll need to use the sticky labels to label eight cups Vinegar and eight half liter containers Baking Soda. Pour a half a cup of vinegar into each group of plastic cups and a small amount of the baking soda into each half liter container. Place one one-milliliter spoon into each container of baking soda.

It is essential that the syringes run smoothly. Before each session in Part 1, pull the plunger out of the barrel and spray a couple of quick blasts down the inside of the barrel. Then spray the rubber tip like this. Watch for any spray falling on the floor. It can be very slippery. You may want to do this outside.

This syringe was specially designed for this module. Notice the notches along the plunger. When you push this back down and pull up, the first notch shows at five milliliters. The second notch means it's a quarter full. The third notch, half full. The fourth notch, three-quarters full. And all the way up, totally full.

Each student will need a strip of seven dots. You can give the students the dots by cutting them along the line just like this and that will give you a group of seven. Begin this session by telling the students that today they will investigate an acid, vinegar.

Teacher: Today we are going to use an acid as our indicator. And the acid that we're going to use is vinegar.

Narrator: The teacher gives the students the container of vinegar that each group will use and introduces baking soda. She asks the students what they think baking soda is used for at home. She asks them what they think will happen if they mix some of the baking soda with vinegar.

Teacher: Ashley?

Student: It like all kind of bubbles and it fizzes.

Narrator: The teacher demonstrates the procedure. She measures a level one milliliter spoonful of baking soda into an empty cup. She then shows the students how to measure five milliliters of vinegar into the syringe.

Teacher: I have a flat spoonful of baking soda. And then I'm going to empty it into the empty plastic cup. Then with my syringe, I am going to measure five milliliters. That's not very much. Just five milliliters of vinegar. There's not a stopper on this syringe. But there is a cut in the syringe to let you know where five milliliters is at. And if I pull this all the way out, you can see that it's this triangle cut right here, this flat edge. And that stops when you get to that point, it stops where the black measures at five milliliters. That's all the vinegar that you need.

Narrator: The students slowly squirt the vinegar into the cup with the baking soda and watch the reaction.

Student: A little bit more.

Student: No.

Student: We'll see what happens.

Student: It's all bubbling.

Student: Wow.

Student: It is so many bubbles.

Narrator: The teacher asks the reporters to share their observations.

Student: First we put vinegar in the baking soda. And then when the bubbles started going, when the bubbles started blowing, I think the vinegar -- it's like something happened. And the smell it's like changed because the -- because the baking soda went like -- got it in vinegar.

Teacher: You told me it didn't smell like --

Student: It didn't smell like vinegar anymore.

Teacher: That's right. It doesn't smell like vinegar anymore.

Narrator: The teacher explains when baking soda is mixed with acid, a chemical reaction occurs. The fizzing, bubbling, change of smell and foaming up are all evidence of a chemical reaction. The teacher explains that the students will now get to do the test again. But this time they will place the baking soda in the bottle with the stopper with it. They will place the five milliliters of vinegar in the syringe and gently push the syringe into the stopper. They need to push the plunger down to add the vinegar to the baking soda and then let go of the plunger.

Teacher: Put it inside. Let go.

Student: Okey dokey.

Student: Cool.

Student: Okay. Go ahead.

Student: Okay. Let go.

Student: Let go.

Narrator: The most likely variables that cause the range of results are that the syringes have not been duplicated well enough or the students may not have measured accurately. The teacher will give the students the opportunity to conduct this experiment again so they can get more uniform results. The teacher reminds the students to record their observations in their Food and Nutrition Journals.

Teacher: Some of the groups got different results when they did the experiment. What happened when you did this experiment? What were the results that you got?

Michael?

Narrator: The teacher leads the class in a discussion. She begins by asking the students what happened. Some of the groups did the experiment more than once and found that their plunger went all the way up. She then asked them how the plunger went up and why. The students figured out that the chemical reaction produces a gas. The gas needs somewhere to go so it pushes the plunger up. So where does the gas go when they did the experiment in the cup? Into the air.

The teacher explains that this gas is called carbon dioxide, the same gas that yeast produces in the presence of sugar. The teacher explains how to use the notches on the syringe plunger and asks the students what they think would happen if they did the same experiment again but this time substituting water for the vinegar.

In order to find out, the getters get a cup of water and a one liter container. The students empty the contents of the bottle into a one liter container. Next they conduct the test by adding water to the baking soda in the bottle.

Student: That looks good.

Student: It didn't do it.

Student: It's not doing anything.

Student: Maybe it's not getting anything over here.

Student: Oh, yeah, the syringe did.

Student: So it didn't go up.

Student: So really nothing happens.

Student: It didn't fizz, either.

Student: So we just write when we put in the water, nothing happened. Unlike the vinegar. Because it rised with the vinegar. Okay.

Narrator: The groups discuss their observations and then record them in their journals. The teacher introduces the student sheet and the students use the recording dots to indicate the reaction of the baking soda with vinegar and the baking soda with water like this.

Now the students are challenged to find out what happens if they mix a 50/50 solution. Each group needs to come up with a plan to make a 50/50 mixture of water and vinegar. This is a good problem solving opportunity.

Student: It's like right there.

Student: So we like take it up to like five or whatever. And we like go down until it's like right

there.

Student: About two and a half.

Student: And then we just keep it in there. And then we put the vinegar in and take it up all the way to the 5.

Student: Why?

Student: Because then it works.

Student: Take the vinegar up to the five?

Student: Okay. We get the water up like to the five. Then you squirt it out until you get to the two and a half. Then you keep it like that and put it in the vinegar and pull it up to five.

Student: Okay; okay. That's good. Then you have vinegar and water.

Narrator: Not all of the groups will have the same plan.

Teacher: I want 50% water and 50% vinegar.

Student: Put in ten.

Teacher: I only used five the other two times. I only want a total of five. How can I have a 50/50 mixture with a total of five milliliters?

Student: Put two fifths and two fifths.

Teacher: So put in 2.5 of water and 2.5 of vinegar?

Student: Yeah.

Teacher: How are you going to do that?

Student: Put in some water to 250.

Teacher: Do you want to go ahead and put that in?

Student: Then I have to do this.

Teacher: Okay. Now put it --

Student: And now I'm going to put it in here.

Teacher: Okay.

Student: And I'm going to put it in.

Teacher: Let go. See what happens.

Student: I can't see.

Student: I can see. It works a little.

Teacher: Watch what's happening. It's still moving.

Student: It's still moving.

Teacher: What did it create?

Student: Carbon monoxide.

Teacher: Carbon dioxide. But you're right. It created the gas. How far did it go? Look up here. How much did it go up?

Student: Two --

Student: Is that a half?

Teacher: Look. Our half one is still down here. Did it go halfway up?

Student: It's one-fourth.

Teacher: But our fourth one is right here. Where do we need to put it?

Student: Like right here.

Teacher: So halfway in between those two? That's what you guys found.

Narrator: The students realize that baking soda is an indicator of acid so the amount of gas produced in the acid test reaction tells you the relative concentration of the acid. The more concentrated the acid, the greater volume of gas formed.

In this part, students should learn that vinegar is an acid. Baking soda is an indicator of the presence of acid in food. The amount of gas produced in an acid test reaction is an indicator of the concentration of the acid.

Be sure to check the Science Stories folio and plan time for the students to read the stories.

<Investigation 3, Part 2>

Narrator: In this part, students use baking soda as an indicator of the presence of acid in a variety of fruits. Here is what you'll need for this part: From the kit: Baking soda, plastic cups, half liter containers, one milliliter spoons, syringes, sticky labels, blue recording dots, reaction bottles, silicon spray. And from the measurement kit: One liter containers.

You'll need to provide the Food and Nutrition Journals, paper towels, an assortment of citrus fruits and water. You will need a minimum of one grapefruit, one orange, two lemons and two limes. It is a good idea to have extra fruits available in case of spillage or if there is not very much juice in one of the fruits.

You will need the student sheets called Acid Test from Part 1. Have Assessment Chart For Investigation 3 available.

Ask for a group of volunteers to wash and dry the equipment after this session. It will become sticky from the juice.

Use sticky labels to label the half liter containers Baking Soda. Just before the session begins, put a small amount of baking soda in each of the half liter containers. Place a small one milliliter long handle plastic spoon into each container of baking soda.

To begin this part, mention to the students that you've heard that there's acid in foods. Show the citrus fruits and ask the students how they might compare the amount of acid in each fruit. The students begin to set up the acid test to test the fruits. They squeeze the juice from the citrus fruits into labeled cups.

Student: It's hard.

Student: Lemonade.

Student: Oh, sort of.

Student: We just need some sugar and water.

Student: No. It's lemon juice.

Student: Don't squirt anyone!

Student: Yeah. Make sure it doesn't go in your eye.

Student: It's going to hit me.

Student: Lemonade.

Student: It's limonade.

Student: Yeah.

Narrator: The class will need about 50 milliliters of each juice. After the juice is squeezed, the cups are placed in a juice station. The teacher reviews the process for testing for acid with baking soda.

Teacher: Does anybody know what the indicator was for acid that we learned about yesterday? Frank?

Student: Baking soda.

Teacher: Baking soda, correct.

Narrator: The students write the names of the fruits on the student sheet from Part 1. After the getters get the equipment the students will need, they bring the syringe to the juice station and get five milliliters of one of the juices to bring back to their tables. The starter measures one level spoonful of baking soda and places it in the bottle. He puts the lid on tightly.

One student places the syringe into the rubber top and squirts the juice into the bottle. The students use the cutouts on the plunger to measure. The students place recording dots on the chart to indicate how much gas they measured. The students empty the contents of the bottle into the container before doing the next test.

If the plunger starts to stick in the barrels of the syringes, show the students how to pull up on the plunger to get it moving and then push it back down. Tapping the plunger to jar it loose works well, too.

Student: It's not moving.

Narrator: A completed student sheet might look like this. Now the teacher calls the students together to discuss the results.

Teacher: Did any of the juices have acid in them?
Ashley?

Student: Yes.

Narrator: The teacher asks which fruits had the most acid. She asks the kids to think about what these fruits taste like. Then she asks what is the relationship between the taste of the fruit and the amount of acid. The students see that sour fruits have more acid. Based on that, the students think that sour candy and green apples may have acid in them.

Before ending this session, the teacher asks the students to complete the response sheet. This will help her to assess how well the students understood the concepts in this investigation.

Students should understand that lemons and limes contain more acid than grapefruits and oranges and different types of fruits have different concentrations of acid. Continue to add ideas to the student Project Folder.

<Investigation 3, Part 3>
Narrator: In this part, students learn a technique to test for the concentration of Vitamin C. They'll use this test on a variety of drinks. Here is what you'll need for this part: From the kit: Half liter containers, plastic cups, the tall dispensing bottles, droppers, a vial, indophenol, a small blue measuring spoon. From the measurement kit you'll need a 1,000 milliliter beaker and one liter containers.

You'll need to supply the Food and Nutrition Journals, paper towels, a two liter plastic bottle and an assortment of orange juices and orange flavored drinks and a Vitamin C solution in a vial. Duplicate the student sheet called Vitamin C Score Sheet and the student sheet called the Response Sheet - The Acid Test, which you can use for assessment. Have Assessment Chart For Investigation 3 available.

During the investigation, students will need to rinse out their test bottles. They can pour a little water into the bottles, swirl it around and pour it into the waste container. For this part you will need one 250 milligram Vitamin C tablet dissolved in a vial of water. Just before the session begins, gently shake the solution, remove the cap, pour it into the one liter beaker and fill with water to the 700 milliliter line.

Various fruit drinks will be compared to this Vitamin C solution. An orange drink series is fun. You may want to ask students to bring in juices and drinks such as fresh, frozen, canned and boxed orange juice. They can also bring in orange drinks and orange flavored powder drinks that have not been fortified with Vitamin C. Place each drink in two labeled cups and put them at the juice station.

The liquid solution of indophenol should be made up the day you plan to conduct the investigation. Rinse out a two liter bottle. Use the mini blue measuring spoon to measure the indophenol. Use the craft stick to level the spoon and place it into the two liter bottle. You'll need a second spoonful. Fill the two liter bottle with tap water. Swirl it gently. Fill the dispensing bottle with the solution. Cover it tightly.

Just before the investigation, you'll need to fill two dispensing bottles with the solution. Begin this investigation with the following explanation:

Teacher: In yesterday's investigations we found out that citrus juices contain acid.

Narrator: The teacher explains that the test did not tell what kind of acid was in the fruits. There is one acid that is essential for health and it's called ascorbic acid or Vitamin C. She tells the students that humans cannot make Vitamin C in their bodies so they must get it from the foods they eat and drink. Today they will use a special indicator called indophenol to test things to see how much Vitamin C they have.

Teacher: It's up to the ten milliliter mark. Then what you are going to do is take a dropper this time instead of a syringe. And you're going to get some of the juice that you're going to test. And in this case, I'm going to test --

Narrator: The teacher demonstrates the process to the class using the Vitamin C solution.

Teacher: This is a Vitamin C solution. I'm going to fill my dropper with the Vitamin C solution. And then watch what happens to see how this is an indicator. I'm just going to put the Vitamin C solution one drop at a time.

Narrator: Note she swirls the bottle after every few drops. The teacher points out that the challenge is to find out how many drops it will take to turn the blue indicator clear. So they must count each drop. She advises them if they add too many drops, the indicator will turn to the

color of the liquid that has been added. Before testing the next juice, discard the old juice into the one liter waste container and rinse out the bottle.

The teacher introduces the Vitamin C Score Sheet. The students will record the drink tested and the number of drops it took to turn the indicator clear. After the getters bring the equipment to their tables, they bring the bottles to the station and very carefully fill the bottles to the black line with the indicator. They bring back one of the drink cups with the bottle. They will pass the drinks from group to group until every group has tested each drink.

Teacher: Okay. Be careful to swirl as you go.

Student: One, two, three, four.

Teacher: Okay. Put it on here. It's easier to see whether it's changing or not.

Student: Five, six, seven, eight.

Student: It's turning purple. Light.

Student: Nine.

Student: Oh, look at it.

Teacher: Okay. There you go.

Student: Nine.

Student: What is it?

Teacher: That's Hi-C orange. Now look at the difference in the result you got between Tang and Hi-C. It took you 14 drops to get it clear with Tang and only 9 with Hi-C. Why do you think -- hang on now. Why do you think they name the drink Hi-C?

Student: It has Vitamin C.

Teacher: What does that mean?

Student: It’s got more Vitamin C.

Teacher: So will it take more or less drops if it's got more Vitamin C?

Student: Less drops.

Teacher: Okay. See if that continues with the rest of the solutions that you work with. Don’t forget to swirl it.

Student: 16 drops.

Narrator: This orange drink was the most challenging. No matter how carefully the groups did the test, the indicator never went clear. It went from purple to orange. Why?

Student: 29, 30, 31 --

Student: Now, shake it up real good. Shake it up real good.

Student: 32, 33, 34 --

Student: Orange drink didn't work because, I mean, it doesn't have any Vitamin C in it. Zip. Nada. Nothing. No wonder it didn't work. It was like blue, purple, orange, blue, purple orange. No clear. So there's like no Vitamin C.

Student: It never turned orange.

Student: It kind of like turned a purplish orange.

Student: See, no Vitamin C. It doesn't say Vitamin C anywhere on it.

Student: There's no Vitamin C in it.

Narrator: After the tests are complete and the data is recorded on the student sheets, the teacher reviews which indicator was used to detect acid. What is the evidence that acid was present? What ingredients in food make them sour? How is the production of CO2 in the acid test like the production of CO2 in the sugar test? Why do you think cooks put sour milk and baking soda into pancakes and biscuits? What are some good sources of Vitamin C?

Teacher: What did you find out about things such as orange soda?
Ryan?

Student: The soda took 50 drops because it was so high -- so low in Vitamin C.

Narrator: And what about that orange drink?
Jessica?

Student: Well, we tried it like five times and it just kept turning like purple or purple orangeish. But it never turned clear. And when we went up there to check the bottle, it didn't say there was any Vitamin C in it. We figured out it never turned clear. It didn't work.

Narrator: The teacher explained the blue turned to orange because the liquid became saturated with the orange drink and so it turned orange. In this part, students should have learned that indophenol is an indicator of ascorbic acid in foods.

This brings us to the end of Investigation 3. Be sure to select several of the interdisciplinary activities to use with your students and have them complete the math problem of the week before going on.

<Investigation 4, Part 1>

Narrator: In this investigation, students learn that foods are combinations of many nutrients. Here is what you'll need for this part: You will need to provide a variety of foods. Small posters of the foods that are suggested for inclusion in lunch planning are included in the kit. But the lesson is much more interesting if you have the real foods available. The packages can be full or empty. So you may want to start saving packages early. Students can help you by bringing in packages. These are some of the foods you will need.

You will need to duplicate the student sheet called What Food Is It? The Student Sheet called Lunch Worksheet and the Student Sheet called Nutrition Information. Make one copy of the Assessment Chart For Investigation 4.

Begin this session by asking the students if they can use their knowledge of food and nutrition to plan a lunch.

Teacher: All right. We've been talking about fats and carbohydrates and what makes a nutritious, healthy meal. And today you're going to get a chance to plan your own nutritious, healthy lunch. But there's a catch. And the catch is you're not going to be able to see what each thing is. All you are going to get is a list of ingredients. And you need to figure out what that particular thing is.

Narrator: The teacher explains that the students will get a list of foods. But they will only have the ingredients, not the names of the food items. He reviews that ingredients and packages are always listed in the specific order from the greatest to the least. The getters get the student sheet called What Food Is It? The teacher has everyone look at the first item and ask what is the major ingredient.

Teacher: No. 19 has potatoes, vegetable oil and salt. What do you think that might be? Jennifer?

Student: Potato chips.

Teacher: Yes.

Student: Mustard seeds and salt and spices. We don't even need to -- that's not very important.

Narrator: The students are now challenged to work collaboratively to figure out what the other 19 food items are.

Student: A roast.

Student: What?

Student: A roast.

Student: Beef and pork.

Student: Beef I think.

Student: Hot dog.

Student: Yeah.

Student: Carbonated water. Caramel colors. Natural flavors. Artificial flavors.

Student: Carbonated water. Caramel color. Natural flavors. Artificial flavors. Aspartame. Have you heard of aspartame before?

Student: No.

Student: Probably a drink. Most drinks have citric acid.

Student: No. 18.

Student: You're right. Cabbage.

Student: I hate coleslaw. Yeah, mayonnaise. That's coleslaw.

Student: It's like a pig saying slaw.

Student: Natural flavors.

Student: Coffee!

Student: Oh, yeah. Because it says spices and salt. So we got that one right. Now look for a cracker.

Student: What about the sodium?

Student: Oh, yeah. Cracker, you guys, for No. 2. Crackers --

Narrator: When the students have completed their challenge, the teacher goes over the sheets with the students. He asks for a volunteer to name the food and give evidence used to identify the food. He then asks how many agree. He confirms the guess or asks for another idea and continues through this list in this manner.

Teacher: Yeah and that told you it was --

Student: Mustard.

Teacher: Mustard, yeah. Number one, mustard seed being the main ingredient.

Narrator: Now the students are asked to look at the small boxes next to each ingredient. They are challenged to go through the list and label the ingredients they believe are sugars with an S. Next they go on to label fats with an F, acids with an A and a question mark for ones they don't know. The students should complete this assignment by identifying which products are high in either sugar or fat.

Student: Let's check our list.

Narrator: Now the students use a copy of the lunch worksheet to plan a menu using the 20 lunch items at the food station. They can select up to six items and write their selections in the lunch item column of Part 1. When the students have completed their selections, the teacher tells the students that nutrition is the process by which organisms get the building materials and energy they need to stay alive. Animals, including humans, get their nutrition by eating foods.

He adds that in addition to ingredients, all packages list nutritional information on their labels. The nutritional information includes the amount of fat, carbohydrates and protein in a serving. He asks the students to use the nutritional information sheets to fill in the protein, carbohydrates and fat columns of their lunch worksheets for each of the lunch items they selected.

Teacher: All of the concepts we talked about, how much fat, carbohydrates and protein we need. And you're going to put all of that into your lunch menu.

Student: Okay. Let's check what we have. How much --

Student: For doughnut, protein is 2 grams.

Student: Okay.

Student: For doughnut, the carbohydrate is 25 grams.

Student: And for the fat, it's 12 grams.

Narrator: The teacher explains that people get the energy they need for life from the food they eat. Every gram of carbohydrate we eat gets converted into four calories. Every gram of protein gets converted into four calories. And every gram of fat gets converted into nine calories.

The teacher asks the students to add up the number of grams of protein, carbohydrates and fats in their lunch selections. They need to multiply the grams by the appropriate factor, either four or nine, and write those numbers in the column. Finally they should add together all of the calories to arrive at the total number of calories in their lunch.

The teacher tells the students that the recommended daily consumption for calories for fifth graders is about 2200 for girls and 2600 for boys. The children have information on their charts about the recommended lunch calories for boys and girls and the recommended fat calories for boys and girls.
He now asks the students to review their lunches to see how well they measure up to recommended guidelines.

Most of the students find that their lunches exceed the guidelines. This is a good break point in this activity. The teacher begins the next session by reviewing the previous session. He asks when your body metabolizes food, how many calories comes from each gram of protein, carbohydrates and fats? The teacher goes on to discuss what foods make up a healthy diet and what kinds of things happen when the child's diet is not healthy.

The students have a chance to select items for a second lunch this time using the nutritional information to guide their choices. Nutritional information listed on food packages helps us to make healthy food choices. Be sure to check the Science Stories folio and plan to have the students read the stories. This is an important time to have students add to the Project Folder.

<Investigation 4, Part 2>
Narrator: In the last part of this module, students work on their own investigations. As they work on their projects, you will gain insight into how well they understood the introductory concepts of food chemistry. This is the time to bring out the Project Ideas folder. As much as possible you want students to use their own ideas and investigate the questions they have come up with during the module. If you don't have enough ideas in the Project Folder for everyone to investigate, 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 materials and keep tabs on what the students are working on. You will need to decide whether or not you will be able to supply any additional equipment the students ask for. You will 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 sheets. You should plan about two weeks for the students to work on their projects. You can allow them time to work on it at school and suggest they work on it at home, as well.

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 assessments, an End-Of-Module test given in a variety of formats and suggestions for assembling portfolios.

This is the end of the Food and Nutrition module. Remember, there are many more details included in the Teacher's Guide that we weren't able to present here in this video. I hope you enjoy working with this module as much as my students did. And remember, my students once said to me "I'll never look at a potato chip again the same way. At least for a couple of weeks."