

FOSS® Wood and Paper Teacher Preparation Video Transcript

<Larry Lowery Introduction to FOSS Program>

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

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

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

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

<Lee Agler Introduction to Module>

Narrator/Lee Agler: Hello. I'm Lee Agler. And I'm here to get you started with the Wood and Paper Module. One of the fundamental concepts in physical science is that all objects are made from one or more materials and that these materials have observable properties. Some materials occur in nature like wood. While others, like paper, may start off in nature and then are designed and processed by people. In this module, students become scientists as they observe and compare the properties of a variety of wood and paper, investigate how wood and paper interact with water and, hopefully, come to appreciate the many uses we have for these materials in our world.

The purpose of this video is to give you an overview of all of the preparations you'll need to make for the investigations and also to give you a glimpse of a classroom in action. However, for all of the details, you'll want to see the Teacher Guide.

Most of the equipment you'll need for all of the investigations come packaged in these two boxes. There are enough materials for two classes of 32 students. Some of the materials are consumable and some are permanent, so be sure to check the inventory list found in the Teacher Guide so that you'll know what's what.

Here is the all-important Teacher Guide. Take some time to read the overview folio before starting this module. It's full of helpful suggestions, including correlations to the national standards, background information, classroom management, and tips for scheduling the module. Whether you teach a full day, half day, or combination kindergarten class, the overview matrix summarizes the investigations and will help you plan the entire course of the module.

In the materials folio, you'll find an inventory list for the kit, materials that you'll need to supply for the investigations, directions for preparing the materials, and information on ordering any replacements. The next folios are the investigation folios. These are the heart of the program, which will be described in this video.

In the next section are the duplication masters. Here you'll find all of the student sheets used in the investigations. You'll find duplication masters for the Center Instruction Cards. These are designed to be used by parents or other adult helpers to guide the students through the activity. You can laminate the copies or put them in plastic sheet protectors to become permanent equipment in your kit. There are also masters for the Home/School Connections for each investigation.

One set of student books and a big book come in the kit, the Foss Science Stories. In addition, there are two books that go so well with the module that we have included their optional use during the investigations. Information on using the FOSS Science Stories, "Mighty Tree" and "The Piñata Maker," is found in the reading connections folio in the Teacher Guide. The resources folio lists other wonderful books for yourself and your students.

One of the things to think about before beginning this module is that many of the investigations take place with small groups at a learning center with an adult guiding the investigation. If you are the only adult in the classroom, you'll find suggestions in the overview folio on how to run the centers on your own or how to turn them into whole class experiences. In either case, you should plan on only introducing one investigation part on

any given day.

There are some preparations that will need to be done before beginning this module. You'll want to make copies of the letter to parents and send it home with your students. The letter tells parents what the students will be doing in the coming weeks and asks for their help in getting paper boxes and small wood scraps you'll need later in the module.

In the last investigation, students will be making sculptures from wood and paper scraps like these. Lumberyards, cabinet shops, and high school wood shops are often very good resources in addition to the contributions from students' families.

Before beginning, you'll need to make two charts. The Word Bank is for new vocabulary learned as the module progresses. The Content Chart is for recording students' suggestions about what they have learned and any new questions they have.

To keep track of student progress, you'll need to make a copy of the two assessment checklists found in the Teacher Guide. The Getting Ready sections of every investigation part suggest specific objectives to assess. Because many of these objectives can be assessed throughout the module, a good strategy is to focus on just a few students at a time during any given part. Now we're ready to begin.

<Investigation 1, Part 1>

Narrator: In Investigation 1, students explore the properties of wood and discover how wood interacts with water. In Part 1, students observe and compare the properties of five different kinds of wood.

Here is what you need from the kit: You'll need the five clear plastic basins and the wood samples: particleboard, basswood, pine, plywood, and redwood. You'll also need the three tree posters found in the kit: pine, redwood, and linden tree. Also, you'll need the two wood production posters.

To get ready, take a close look at your wood samples. Pine and basswood look very similar. If you're the first person to use the kit, we suggest you take a permanent marker and make a small dot on each end of the basswood samples, so that you'll be able to easily tell them apart.

To begin the activity, the teacher calls the students to the rug and shows them the wood samples. They discuss what they are and where they came

from.

Teacher: How many are you going to get?

Class: Five.

Narrator: Each student picks up a set of five wood samples from the basins. This teacher has put the basins on the floor. You might want to place them on a small table, so students can line up on both sides to speed up the process.

Students begin exploring the samples. They build little towers, trains or houses at first. But then the teacher guides their observations by asking questions.

Student: Man!

Narrator: The students need plenty of time to explore the samples before they can begin comparing the properties of wood. Once students have had time to explore their samples, they learn the names of the different kinds of wood.

Teacher: All right. Here we go. We have redwood. Can you say that?

Class: Redwood.

Teacher: Now, the next one is a toughy. Find a light piece of wood...

Student: Right here.

Narrator: After describing and presenting the names of the pine, redwood, and basswood, the teacher shows the three posters of the trees that go with each kind of wood.

Teacher: What kind of tree?

Student: Pine tree.

Teacher: Good. Now you have to find the one that has layers on the side. Plywood.

Student: Plywood.

Teacher: Again.

Student: Plywood.

Narrator: The wood production posters show how plywood and particleboard are made. Every investigation part concludes with a short class discussion. Any new or important vocabulary that came up in the investigation is added to the Word Bank and student discoveries are added to the Content Chart.

<Investigation 1, Part 2>

Narrator: In Part 2, the whole class goes on a wood hunt. They then label objects in the classroom that are made out of wood. From the kit, you'll need the basins and wood samples from the last part, the tape, and a copy of the duplication master called "Wood Labels." To get ready, you'll need one set of wood samples to place around the room at obvious locations. You'll need a separate matching set of wood to distribute to students to use in finding the samples.

For example, if you have 30 students, you'll need six of each kind of wood for each set. Have a few extra samples on hand in case some students have trouble finding their matching sample. Cut up the labels and put them in a spot where students can reach them. Put small pieces of tape on the edge of that counter for students to get to quickly during the activity.

Teacher: So how many pieces are you going to get from this container?

Student: One.

Teacher: How many pieces are you going to find along the room?

Student: One.

Narrator: To begin this part, the class reviews the wood samples. Then the students go on a wood hunt. Each student gets a sample of wood. Their job is to look around the room, find one wood sample that is the same as the sample that they have and bring both pieces back to the rug.

Student: Maybe they are under that chair. Maybe under that chair.

Student: I can't get any out of there.

Student: Out of there?

Student: I got one.

Student: Redwood.

Student: I found one.

Student: We found one.

Student: Does this match?

Student: I found one.

Teacher: Next look for the rough one. The rough one. Particleboard.

Narrator: When all of the students have returned to the rug with their matching samples, the teacher calls out the names of certain properties of the wood samples and students stand if their wood matches what the teacher has asked for.

Teacher: If you have plywood, would you please stand up? You are going to put your tape on the edge. Then you're going to look for anything in this room that is made of what?

Student: Wood.

Teacher: Perfect. Well, this is mine, so I can do my own label right now. Okay? My tambourine is made out of...

Student: Wood.

Narrator: First students return their wood samples to the basins. Then they get a label and a piece of tape and set out to label the classroom.

Student: Wood. Wood.

Teacher: There's wood. Very good.

Narrator: Students will find many pieces of furniture, cabinets, and classroom equipment made of wood. They may be fooled when they look at the top of a formica table that looks like wood.

Student: There.

Narrator: Students will enjoy labeling the room and seeing how many things are made of wood.

Student: That's made out of wood.

Narrator: Now that your students have had some firsthand experience with the properties of wood, they're ready to bring that experience to the related literature. This is a good time to share with your class the first science story called "A Story of a Chair," some time during the language arts period after completing this part.

<Investigation 1, Part 3>

Narrator: In Part 3, students observe how water and wood interact. Here is what you need from the kit: Each pair of students will need a basin, a cup, two droppers, and two of each wood sample. For the class, you'll need five half-liter containers and at least two sponges. You'll need to provide water and a two-liter soda bottle makes a good pitcher, newspaper, paper towels, and a turkey baster is optional. This is the Center Instruction Card you'll need for this part.

To get ready, fill the basins about halfway, the cups about a third of the way and put the wood samples for each pair of students into a half-liter container. If this is the first time they'll be using the dropper, you'll need to demonstrate this skill to the whole class. A turkey baster makes a good prop. As you demonstrate, students can practice with their own pretend droppers.

Teacher: That's it. Now, let the water out. Squeeze it and the water will come out. You need to do it again.

Now, what we want to do with the wood you have, I want you to put two drops on each piece of wood and see then what happens. Now watch how fast it soaks in.

Student: What is it doing?

Teacher: That's good over here. And put a couple of drops on each one and watch and see which one goes down faster.

Student: This one soaked in the fastest.

Narrator: Students continue their investigation by dropping water on the

other kinds of wood. Parents or teachers at the center can guide and enrich the students' observations by asking questions such as: Does the water sit on the pieces of wood or soak in? How does it soak in? Does the water soak in right away or does it take some time?

Student: I soaked it in.

Narrator: Does the color of the wood change when it gets wet? After the students have explored dropping water on wood, they load up their samples into a basin of water to see what will happen. They find out that all of the wood samples float. The students may make another interesting discovery. When the samples get very wet, sometimes they will stick together as if there were a magnetic attraction.

<Investigation 1, Part 4>

Narrator: In Part 4, students work in pairs to find ways to sink two kinds of wood samples. Here is what you need from the kit: Each pair of students will need a basin with water, a cup with about 40 jumbo paper clips and two pieces of plywood, two pieces of pine. You'll need to supply the water that's in the basins, paper towels, and newspapers. Here is the Center Instruction Card you'll need for this part.

At the center, the idea is to use the rubber bands and paper clips to sink the wood samples. Each student uses a sample of pine and one of plywood. If the student has trouble getting started, you can show them how to put a rubber band around a sample and slide the paper clip between the wood and the rubber band.

Students work enthusiastically to sink the wood samples. This is a good exercise in small motor coordination, as well. FOSS does not expect young students to be completely accurate or systematic in their approach. Students will often put many paper clips on the wood before they even try to see if it sinks. The standards should be set that a wood sample must be laying completely on the bottom to be considered sunk.

<Investigation 1, Part 5>

Narrator: In this part, students continue their sinking investigation. But now they are encouraged to be more systematic. This works best with second-semester kindergarteners. If you're planning on doing this module in the fall, you may want to skip this part or introduce it later in the year.

You'll set up the center essentially the same as in the last part with newspaper on the table and sponges and paper towels and rubber bands

available to the whole group, and each pair of students will need a basin of water, cup of paper clips and, this time, they will be using particle board and redwood. This is the Center Instruction Card you'll need for this part.

Teacher: You get your rubber band, you get your piece of wood, and you wrap it around. Then, you're going to have to do each one at a time, Kevin.

Put your paper clip under and then you gently put it in the water. Gently put it in the water. Oh, did that sink?

Student: No.

Teacher: No. What do I have to do?

Student: Put some more; put some more stuff on it.

Teacher: More what? Paper what?

Student: Clips.

Teacher: More paper clips. Okay.

Student: Try it.

Student: I think it's going to drown.

Teacher: You think it's going to sink?

Narrator: This teacher continues testing after each paper clip is added until the wood sample sinks completely.

Student: Not yet, it didn't sink. Is it going to take 11?

Student: It keeps going up.

Student: 10 and it drowned it.

Teacher: I remove?

Student: The rubber band.

Teacher: The rubber band. Place the redwood down. And then we are making a clip graph.

Narrator: When all of the samples have been sunk, students will make a graph. The paper clips are removed from each sample and laid next to each piece of wood for comparison. The questions on the Center Instruction Card will help guide the discussion about the graphs.

Here are some of the words and concepts students might choose to add to the Word Bank and Concept Chart during this investigation. The interdisciplinary extensions section at the end of this investigation has many ideas for integrating students' experiences into the areas of math, social studies, and language arts.

You might want to set up an ongoing wood study center or invite a parent or assistant to help students use screwdrivers or small hammers. If you do this, be sure to use soft pinewood.

This girl is learning how to stain wood using watered down tempered paint. In the duplication masters, you'll find the Home/School Connection for Investigation 1. These connections involve little or no materials and lots of opportunity for fun family involvement.

<Investigation 2, Part 1>

Narrator: Investigation 2 is called "Changing Wood." And that's exactly what the students do. They change the shape of wood and they simulate the production of plywood and particleboard.

In Part 1, students change the shape of wood by using sandpaper. Here is what you need from the kit: Each student will need one paper plate, a piece of basswood, and a small piece of sandpaper. The whole class will need just one paper cup to collect the sawdust they create and the Center Instruction Card called "Sanding." To get ready, fold and tear a piece of sandpaper into nine pieces like this. You can also use a pair of old scissors if you don't mind them being dull.

Teacher: What do you think this is?

Student: Sandpaper.

Teacher: Matt?

Student: Sandpaper.

Teacher: Sandpaper. And you can tell it's very rough, isn't it? So now

we're going to take a piece of the soft basswood. And you're going to use the sandpaper and change the shape of this piece of basswood by sanding it like back and forth. Or another way to try it is to put the sandpaper down on your table and rubbing the wood on the sandpaper. See if that's any different. See if you get more or less sawdust.

Student: Look what happens.

Teacher: Which way works better? Notice what's happening as you sand. What's going on on your paper plates?

Student: Sand.

Student: Sand stuff.

Teacher: Sand stuff?

Student: Wood.

Teacher: Wood is coming out. What would we call the wood that's coming on your plate?

Student: Basswood.

Teacher: But when you sand it and the stuff that falls on the paper plate, what's that stuff called?

Student: Oh, yeah, I know.

Teacher: What?

Student: Sawdust.

Teacher: Sawdust. Great. And some of you I notice are getting little black specs. What are these little black specs from? This wood isn't black.

Student: I know. Sand.

Teacher: Sand from the sandpaper. You use your sandpaper and it gets worn down. Take a look at your piece of wood now and tell me how it's changed from when I first gave it to you.

Student: It's softer and rounder on the sliver over here.

Teacher: The sliver is more round?

Narrator: When you finish, collect the wood dust in the cup telling the students that you're saving it for another project. The sawdust makes a good addition to a wood study center or a sprinkling can be taped into students' science journals.

<Investigation 2, Part 2>

Narrator: In Part 2, students compare sawdust and wood shavings to see how they both interact with water. Here is what you need from the kit: Each student will need a screen, half-liter container, cup, craft stick, and one paper plate. For the class, you'll need a bag of wood shavings, bag of sawdust, two paper plates, and a plastic spoon. You'll need to provide newspapers, paper towels, a pitcher of water, and the Center Instruction Card called "Sawdust and Shavings."

To get ready, you'll need to put a heaping spoonful of sawdust into the cups and a heaping spoonful of wood shavings into the half-liter containers for each student. Sawdust and wood shavings are the product of carpentry tools. It's a nice idea to bring in a wood plan and a saw to introduce the investigation to the students. You can speak with a school custodian, a high school wood shop teacher, or invite a woodworker to bring in the tools and demonstrate their use.

Teacher: Feel it. Look at it.

Narrator: When students arrive at the center, they get a cup of sawdust and a popsicle stick. Students explore the sawdust for a minute or two. Then they get the half-liter container of wood shavings to continue their exploration.

Teacher: What's the next one feel like?

Student: Sawdust.

Teacher: Do they feel exactly the same?

Student: No.

Student: Hmm...this one is a little bit harder and this one is soft.

Teacher: Oh, one has dust in the bottom and one doesn't.

Narrator: Next, students pour the sawdust into the wood shavings. Even though the sawdust is poured on top, the students will discover it makes its way to the bottom always, no matter how much they mix it.

Teacher: And put water in one of your cups.

Narrator: The adult at the center fills each student's empty cup about half full of water and encourages the students to sprinkle the mixture of sawdust and shavings onto the water. Students' previous experience was that wood floats, which it does, as well. But within a few seconds, the wood begins to sink to the bottom. When the water soaks into the wood, we say it is waterlogged. And waterlogged wood sinks.

Teacher: The stuff at the bottom is called "waterlogged." It's just soaking wet. It's so heavy, it falls. So we're going to pour it through here and see what goes through and what stays on top.

Student: Oh...

Teacher: Okay?

Student: I want to do that.

Student: Cool.

Teacher: And then you can take what's here...

Narrator: The wet shavings and sawdust are dumped onto a paper plate for students to continue to explore. Students should note now that the wood is wet; it sticks together and is darker. When students try to pack the wood together like particleboard, they will find the wood won't stay together. So you can discuss the need for some sort of glue to hold the pieces together. Be sure to save the sawdust and wood shavings and try them out for the next part.

Student: I am yucky.

Narrator: This is a good time to send students home with the Home/School Connection for Investigation 2. Students bring home two craft sticks, one to keep dry and the other to float in water, to see if it, too, will get waterlogged and sink.

<Investigation 2, Part 3>

Narrator: In Part 3, students make homemade particleboard, what they often call sawdust wood. Here is what you need from the kit: Each student will need a paper plate, craft stick, plastic cup, and a sample of particleboard. For the class, you'll need the dried mixture of sawdust and wood shavings from Part 2, the half-liter containers, two spoons, two pieces of particle board, two pieces of pine, the poster called "Particle Board Production" and the Center Instruction Card called "Making Sawdust Wood."

You'll need to provide paper towels, water, a box or two of cornstarch, scrap paper, a pot, long-handled spoon, and a hot plate or stove to keep things on. The day before this part, you'll need to make the cornstarch matrix. The cornstarch matrix is the adhesive that holds the wood particles together.

Let me show you how to make the cornstarch matrix. You'll need to mix together equal parts of cornstarch and water in a saucepan. One box of cornstarch is about three and a half cups of water. I'm heating this on about medium-to-low heat, stirring constantly.

At first, the mixture will be very lumpy. But then it will smooth out. You'll cook the mixture over medium-to-low heat for about 5 to 10 minutes, stirring constantly. About two minutes before the mixture is ready, it will begin to get lumpy again and quite thick.

When about two-thirds of the mixture is the thickness of mashed potatoes, about one-third is still soupy, it's time to take the mixture off the heat. We don't want to cook it too long, however, it will thicken as it cools. Keep stirring until it's consistent and cool. It will get about as thick as pudding. You can refrigerate this up to a week, if needed.

To get ready, put two heaping spoonfuls of the sawdust and wood shavings mixture in a cup for each student. The cool cornstarch matrix goes in the half-liter containers for the students to share at the center. This is a good consistency for the cornstarch matrix. If it's too stiff, additional water can be added until it becomes pliable.

Teacher: You put one in. There you go. What you'll want to do is take a popsicle stick—just take one...

Narrator: At the center, students are challenged to make their own particleboard. Each student puts a spoonful of cornstarch matrix into their

cup of sawdust and mixes it up with a stirring stick. When the dough is well mixed, it is dumped onto a paper plate and students can continue to mix it with their fingers.

The final product should be the consistency of modelling clay. You can monitor the students' progress and add more matrix if necessary. Once the wood dough is formed, students can shape the wood any way they want. Students often want to make it look just like the particleboard samples. But some others make other shapes.

When students have finished shaping their wood dough, they put their names on a piece of paper and put their wood dough on it to dry overnight. Later, they compare the samples they made with the particleboard samples from the kit.

Teacher: After it dries, is it kind of like a piece of wood? Yeah, it is. It seems kind of strange that you could take shavings and glue and mix them up and you have your very own particleboard.

<Investigation 2, Part 4>

Narrator: In Part 4, students make homemade plywood. Here is what you'll need from the kit: Each student will make three thin wood pieces and, for the class, you'll need two or three pieces of plywood samples, the five quarter-inch plywood samples, and two or three craft sticks. You'll need to supply paper towels, a marker, newspaper and glue, and the Center Instruction Card for making sandwich wood.

This activity is introduced by having students look closely at a piece of quarter-inch plywood and compare it to the thicker samples. They will be making a thin piece of plywood like the quarter-inch plywood. When students have settled in at the center, each gets a quarter-sized pool of glue on their newspaper mat. To make the plywood, they select three or four thin wood pieces. They dip their fingers in the glue and cover one surface of the two pieces of wood evenly.

Teacher: Make a sandwich.

Narrator: Then press the two pieces together. They hold the pieces together while they count to 20.

Teacher: Do you think they look the same?

Narrator: After counting, they are ready to add the other pieces following

the same procedure. If you want their samples to look just like the quarter-inch plywood, have them glue only three thin pieces together.

Teacher: What do you think the difference is? It looks the same, doesn't it? So that's what we've made.

Narrator: The sandwich wood should dry overnight. Before they take their sandwich wood home, they can compare their sandwich wood to a popsicle stick for strength and to a quarter-inch plywood for appearance. They will find that the wood is much stronger when several pieces have been glued together.

Teacher: You can keep this. Okay? We can take this home and keep it.

Narrator: These are some of the words and concepts students might record during this investigation. Some time after completing this part, plan to share the FOSS Science Story called “Are You a Scientist?” with your students. They'll no doubt recognize themselves as scientists just like the students in the photographs.

<Investigation 3, Part 1>

Narrator: In this investigation, students bring their skills of observing and comparing properties to a new material, paper. Just as with wood, students begin by observing a variety of papers and go on a paper hunt.

Here is what you'll need from the kit: You'll need newsprint, corrugated paper, corrugated cardboard, chipboard, tag board, and craft paper. This kit is packaged for two classes of students. So even though you'll find 100 of each kind of paper in the kit, plan to only use 50 of them for your class.

You'll notice that all the papers are the same color, same shape, same size. That's because we wanted the students to focus on the more subtle properties of texture and stiffness.

Students will be working with 10 kinds of paper. You'll remember that six of them already come pre-cut in the kit. But you'll need to cut the other four: facial tissue, paper towels, construction paper, and you'll need to cut the wax paper that came in the kit.

Make sure that you cut 50 of each into four-inch squares, so your class can do all of the activities in the module. Once you've prepared all of your paper samples, each kind of paper is placed in a clear, fluted container for easy distribution.

For part of this activity, students will be going on a paper hunt so you'll need to get some paper samples ready. You'll need one set of samples to place around the room in obvious places. Do this when the students are not in the room. You'll also need a second set for students to use as a reference for finding a match. You'll need enough paper samples so each student gets to match one pair and have a few extra for good measure.

You'll need to copy and cut the duplication master called "Paper Labels" to make labels for students to tape around the classroom. This time, be sure to use the removable tape that you'll find in the kit.

Now you're ready to begin. Before the students go on a paper hunt, they'll need some time to get to know the samples. Students work in small groups using the papers to explore how they are alike and how they are different.

Student: This one is bendable.

Student: This one was made of a little part of paper I think.

Student: Tissue.

Narrator: And then they play a matching game.

Teacher: Who has corrugated cardboard? Hold it up.

Narrator: Then they are ready for the paper hunt.

Teacher: While you were out to lunch, a whole bunch of paper samples were hidden in the rug area in the room. They are not in the area that isn't the rug. Just in the rug area. And I'm going to give each one of you one of these papers. And you're going to be a detective. And you're going to look until you can find one that matches. Okay?

Oh . . . oops, two stuck together. There you go. Let's see. Oh, I'm trying to get some of the different kinds.

Student: Yes!

Teacher: You are going to look around the room, the carpet area of the room, until you find a piece that looks just like yours that matches. As soon as you have a match, I want you to take both pieces. You'll have two that are the same. Come back to the rug and sit down right here. Okay?

You may go.

Student: Here you go.

Student: Paper cardboard.

Student: Yes!

Teacher: Oh, there he found it. Was that the right one?

Student: Yeah.

Student: By Erica.

Teacher: I have a tag here that says, "This is made from?"

Class: Paper.

Teacher: How do you know it says paper?

Student: It starts with a P.

Teacher: It starts with a P. Good. This is made from paper. You are going to get one of these labels and a piece of tape right here. And you are going to find something in the room that's made from paper. And you're going to stick this label onto that.

Christina. Seth. Scott.

Student: But what does it say?

Teacher: What does it say? Who can tell Scott what it says?

Michelle?

Class: This is made from paper.

Student: Can I put it on my paper?

Teacher: If it's made from paper, you can do it.

Narrator: Once the hunt is over, students discuss the many things they found that are made from paper. The FOSS Science Stories extend students' firsthand experiences to those which cannot be experienced directly. In "The Story of a Box," students learn about where paper comes

from and how it is made.

<Investigation 3, Part 2>

Narrator: In Part 2, students use pencils, crayons, and markers to explore the different paper samples and discover what kind of properties are most suitable for writing and drawing. Here is what you'll need from the kit: You'll need six of the paper samples in the fluted containers. These are facial tissue, corrugated paper, paper towels, wax paper, tag board, and newsprint. You'll need to provide crayons, pencils, and markers for the students to use at the center.

To set up the center, the paper samples are set at the end of the table and the pencils, crayons, and markers are set at the center of the table. Here is the Center Instruction Card you'll need for this part. Students begin by comparing two samples, the tag board and the paper towels. First, they use a pencil, then a crayon, then a marker.

These particular samples were chosen because the students will get very different results. Some students will say they can't use a marker because it soaks in too much or puts a hole in the paper. This is all valuable information.

Teacher: What happened to it? What happened to it? What happens? What does it do to the marker? Absorbed. So which one is good for writing? Which paper is good for writing?

Student: This side.

Teacher: All right. Now try the other way.

Student: Look what I did.

Teacher: Look what you did. Which side is good for writing?

Student: This side.

Student: This side.

Student: I had trouble with this side. It's hard.

Teacher: Why is this side hard?

Narrator: After students have tried all of the samples at the center, the

group holds a discussion to determine which were good for writing and drawing and which were not.

Teacher: What is the opposite of smooth?

Narrator: When the groups are finished, save the papers for the next part.

<Investigation 3, Part 3>

Narrator: In Part 3, students will be folding different kinds of paper samples to find out which ones were easy to fold and which were more difficult. Here is what you'll need from the kit: You'll need the chipboard, corrugated cardboard, newsprint, construction paper, wax paper, and craft paper. You'll also need the Center Instruction Card called Folding Paper. The only thing you'll need to provide is one piece of writing paper to demonstrate to the class.

Folding paper in half is often a new concept for many kindergarteners. The first paper-folding experience is quite structured to help students learn this skill. The teacher shows the class a standard piece of 8-and-a-half-by-11-inch paper and how to fold it in half.

Teacher: We fold it in fourths.

Student: Rectangle.

Narrator: The folding continues until the paper is so stiff, it can't be folded anymore.

Teacher: You have to use those thumb and index fingers there. All right. Do you think I can do it one more time?

Student: Yes.

Teacher: I'm afraid not. When we open it, this is...

Student: Three.

Teacher: This is?

Narrator: Students count the number of folds for each time the paper is opened. This is also interesting to see the creases made by the folds.

Student: You folded it six times.

Teacher: Excellent.

Narrator: When students begin to work at the center, they begin by folding the newsprint sample. They then move onto the other samples comparing which are easy to fold and which are more difficult.

Teacher: You're going to crease the edges.

Student: Ah...

Teacher: You fold it once, twice, three times.

Student: The second time...

Teacher: Do you feel like this is harder?

Class: Yes.

Teacher: Get it folded again. Put the easy ones, the ones that are easy to fold, put them in one pile. And the ones that are hard to fold, put them in one pile.

Student: I get it. Put the ones that are easy in the middle.

Teacher: And then the hard ones...

Student: This is easy.

Student: No, the easy pile.

Student: But this is easy to me.

Teacher: Okay. Finish.

Student: No. You're supposed to put all of these ones here and all of these here.

Teacher: Okay.

Narrator: Your fun with paper folding doesn't have to end there, however. In the duplication masters, you'll find easy instructions for making this pirate hat, which can become a whole paper experience. The

Home/School Connection for Investigation 3 has students making their own paper drinking cup, which actually holds water.

<Investigation 3, Part 4>

Narrator: In Part 4, students focus their attention on the interaction of water and paper. Here is what you need from the kit: Each student will need a cup, a dropper. Each group that comes to the learning center will share one plastic basin.

Also at the learning center, you'll need the paper samples: cardboard, newsprint, paper towels, tag board, wax paper, construction paper, chipboard, facial tissue, corrugated paper, craft paper, and a couple of sponges. All you need to supply are newspapers and water. Some optional items include clothesline and clothespins for drying the papers at the end of this part and a turkey baster, which is a good tool for demonstrating how to use a dropper.

To set up the center, the containers of paper samples are placed at the end of the table for easy distribution. A cup with water and a dropper are put at each student's place. The sponges are kept on hand to pick up spills. The Center Instruction Card called "Paper and Water" will guide the activity.

Teacher: Before you start dropping, I want everybody to practice. Carl, sit down.

Student: We have to start all over again.

Teacher: You need to practice with the eyedroppers. You can make one drop for now. Practice until you can make one. Just drop it into the cup. It's right in front of you, Carl.

Narrator: Learning how to use a dropper is quite an accomplishment for many kindergarteners. You will need to show the students step by step how it works.

Teacher: Okay. Good. Now, I want you to find...

Student: You get another one.

Teacher: ...your paper towel and your tag board.

Student: This?

Teacher: Which is paper towel and which is tag board? Perfect. Everybody is ready. You're going to start by putting one drop of water on the paper towel and one drop of water on the tag board. One drop on each one. And then I want you to tell me what you observe. What do you observe about those drops of water?

Student: The water went through this one and the water didn't go through this one.

Teacher: Okay. Who else can tell me what they observed?

Student: This one...

Narrator: After the teacher or other adult guides the students through the first investigation, they encourage the students to continue on their own with all of the other papers.

Teacher: If you spilled a big glass of juice at the dinner table, would you want to take a piece of chipboard to soak it up?

Student: No.

Teacher: Would that be a good kind of paper to use for cleaning a spill?

Student: No.

Student: This kind of paper.

Teacher: Is there another one that would work well?

Student: This one.

Teacher: Good. That would work well. Because it absorbs, it soaks it up. Good. If you wanted to make a box to put something...

Narrator: When they are finished, each student chooses a sample to soak overnight. Your goal is to encourage each student to soak a different kind of paper.

Teacher: Okay. And Christina, can you pick one nobody else picked? Oh, the chipboard.

Narrator: You'll want to plan some time the next day to observe the papers that have been soaking overnight. You'll find that some of them like this cardboard have changed dramatically. While others, like this wax paper, haven't changed very much. Some of the paper, like this facial tissue is pretty much turning to pulp.

If you let the samples dry up overnight, students can compare them to their original samples. For example, this paper towel that's been dried looks pretty much the same as its original. But if you compare the corrugated paper that's been soaked and dried to its original, you can see how much it's been changed.

These are some of the words and concepts students might record during this investigation.

<Investigation 4, Part 1>

Narrator: In Investigation 4, students learn two techniques for changing paper into something new. In Part 1, students are introduced to paper recycling.

Here is what you need from the kit: Each student at the center will need two screens, a sponge, and a plastic bottle with a lid. Also at the learning center, you will need the wax paper, two half-liter containers, two basins, and the sticky notes. You'll need to provide newspaper, toilet tissue—the cheaper, the better, single-ply is great—and water. Here is the Center Instruction Card you'll need for this part.

Before you introduce recycling to the class, you'll need to follow the procedure yourself first so that you have a sample to show students when you introduce the activity. This is plain. This one I made with glitter.

Student: You're crazy.

Narrator: The students at the recycling center begin by stuffing toilet paper into their bottles. You will add the water or you can send them to the sink. Fill the bottles to about a half-inch from the top.

Student: I'm ready.

Teacher: Okay.

Student: I'm ready.

Student: I'm ready.

Teacher: Okay. Thank you for waiting so patiently. That's very nice.

Student: I need more in here.

Narrator: The lids should be screwed on tightly before the students begin shaking the bottles. It will take about three to five minutes of shaking for the paper to break down to very small pieces called pulp.

Teacher: Eric, Catherine, come up. Carefully take your cap off and pour it onto the screen. Eric, you can come all the way to right here.

Student: Am I finished? Am I?

Narrator: Two students at a time can screen their pulp at the basins. They pour their bottles into the screen, keeping it within the limits of the half-liter containers underneath. They will need to shake and gently bump the end of the bottle to get all of the pulp out.

Student: I think I'm done.

Teacher: Just shake a little bit more.

Narrator: If some of it gets stuck, just add a little more water.

Teacher: Okay. How are you doing, Eric?

Student: Fine.

Teacher: Are you ready?

Student: Now I'm done.

Teacher: And carry that back to your place and blot it with your sponge. And Catherine, the same thing with you. Can you put this on top? Carry it back to your place and blot it with your sponge. Wait just a minute, Brian. Okay. There we go. Okay. Right there. Okay. Carl, take the top screen off and carefully, carefully flip it over onto the wax paper right here. Great. Yeah. Now where is your bottle? Start in the middle and press out to the sides. And then use your sponge to soak up any water that comes out. Right here. No, you don't have another paper yet.

Student: I'm done.

Teacher: Great. Will you put your things back in the pile, please, and stick that on your wax paper so you know whose it is? Okay, Brian.

Narrator: After the recycled paper has dried, students can decorate their samples with food coloring or paint.

Now that students have had an experience with recycling, it's a good time to introduce the concept of resources and the careful use of resources. There's a chapter in the FOSS Science Stories called "Land, Air, and Water." This is a good time to read this together with the class.

<Investigation 4, Part 2>

Narrator: In Part 2, students learn a paper mache technique to change paper from something that's flexible to something that's stiff. This part can take anywhere from one to three sessions.

Here is what you'll need from the kit: Each pair of students will need a quarter-liter container to hold the wheat paste and two half-liter containers to serve as molds for their paper mache bowls. The sticky notes are used to label their creations. You'll need to provide water and flour, a spoon or fork, mat knife or screwdriver, scissors, and lots of newspaper. If you want the students to decorate the finished bowls, you'll need to provide paint, or colored paper, or colored tissue paper, sequins, or any other decoration you'd like the students to use.

To get ready, you'll need to mix up the wheat paste. You'll mix equal parts of flour and water. Stir it up until it's the consistency of thin pancake batter. And you'll need about two cups of this for every eight students. You'll also need to make yourself a sample of a paper mache bowl to show students when you introduce the activity.

To set up a center, start by covering the whole table with newspaper. That will make cleanup easier. Then each student will need a supply of newspaper. Take your newspapers, fold them in half, and half again. Tear them in half, a half for each student. Then the pair can share the container of wheat paste and each student gets a half-liter bowl to use as a mold. The Center Instruction Card called "Paper Mache" guides this activity.

Teacher: Take it off.

Narrator: To begin, the students are shown the sample container you've

made so they have an idea of what they will be striving to make. When students arrive at the center, their first job is to tear the newspaper into strips about one-inch wide and, in shorter strips, about four inches long. Be sure they tear all of the strips before they start using the paste. Next, students paint some of the paste over the molds.

Teacher: Okay, Lauren, now put the paper on there.

Narrator: They lay a strip of newspaper over the painted area and then proceed to paint the strip with additional paste.

Teacher: You want it nice and wet. Put some more on the top now so you can stick one on. You have to get all of that wet. Put a whole bunch on there. Put some more on there. There. You can tell when it's wet because it's kind of all slippery. When it's dry, your fingers don't slide on the paper very much. Wow, you have got a lot.

Narrator: They continue adding more strips until the entire mold is covered. Encourage students to lay the strips of paper across each other so they overlap and the bowl will be strong when it dries. Two layers of paper mache are definitely stronger than one.

Teacher: Get it nice and wet, Brett. See your wings up here?

Narrator: Printed newspaper is useful for the initial layer but, after it has dried for two days, a second layer can be added using tissue paper, paper towels, or colored paper.

Student: Yeah, Brett.

Narrator: The contrast of print to plain makes it easy for students to tell when they have completely covered the first layer and you won't see the print when you finish the project complete.

Student: Look at this.

Narrator: If the paper mache bowl won't come off the plastic container after it's dried, chances are they've just paper mached over the rim of the bowl. It's easy to fix. Take a mat knife. You can cut along the edge of the bowl and then pry underneath. Loosen it up. Then it should come pretty much right off. You can then trim the edge with a pair of scissors to smooth it out.

Here are some samples of paper mache projects that students have finished. If you look closely, you will notice that the students have decorated some of the projects inside as well as out. Here are some of the important vocabulary and concepts that students have chosen to add to the Word Bank and Content Charts.

At home, students recycle paper by making paper collages or paper collage masks. In the process they'll learn more about the properties of paper as they tear, fold, curl, and glue different kinds of paper.

<Investigation 5, Part 1>

Narrator: Enough of playing it straight. In Investigation 5, students use their knowledge of the properties of wood and paper to construct useful or aesthetic objects. In Part 1, they explore how paper boxes are made. The only things you'll need from the kit are these five rolls of transparent tape. You'll need to provide the newspapers, the markers, and your students will bring in the boxes.

The letter home to parents asks students to bring in small boxes. But you might want to bring in a few yourself just to make sure nobody gets left out. This is the Center Instruction Card that an adult at the center will use to guide the activity.

Teacher: What do we have here?

Class: Cereal.

Teacher: A cereal what?

Class: Box.

Teacher: A cereal box. And unfortunately, our cereal box is?

Class: Empty.

Teacher: But what we are going to do is we're going to try and take it apart at the seams. Okay?

Narrator: Students are introduced to this investigation with a brief discussion about boxes. The teacher demonstrates the procedure by first finding the seams and carefully taking a box apart, laying it flat on a piece of newspaper and tracing around the edge of the box.

Teacher: Along the edges...

Student: Why are you going to trace it?

Teacher: ...of the paper box.

Student: Oh.

Teacher: What do we have here?

Student: A cereal box.

Teacher: The outline of a...

Student: Rectangle.

Student: Cereal box.

Teacher: Of a cereal box. Then you are going to have the wonderful fun thing of putting the box back --

Student: Together.

Teacher: Together. That's hard.

Narrator: As students begin taking their boxes apart, you'll need to help them find the seams. Some students think that any straight edge is a seam. If a box gets torn apart, you can use tape to put it back together.

Teacher: Now, remember how I traced the box on the paper? Start tracing, please. Here we go, Cameron. Put your box back together.

Narrator: The real fun begins when students tape the boxes back together into their original shape.

Teacher: Use as much tape as you want.

Narrator: You'll also find this a great activity for learning how to tear tape from the roll.

Teacher: Very good. I'll get you some tape. Here we go.

Narrator: Students will compare their reassembled boxes to the tracings

and see how flat paper can be transformed into three-dimensional containers.

<Investigation 5, Part 2>

Narrator: In Part 2, students learn the over-and-under technique used in weaving as another useful way that paper can be held together. The only equipment you'll need for this part are scissors, glue, and construction paper. You'll need to cut the construction paper six-by-nine inches. And in this construction paper, you're going to be cutting slits for the paper strips to be woven in and out of. An easy way to cut those slits is to set up your paper cutter so you have a piece of wood or other object taped, so that the paper cutter can't go all the way through.

Take several pieces of construction paper. Fold them in half. Make sure the folded half is going to be at the top of your paper cutter. Careful. And then you're going to cut your slits about an inch apart from each other.

One inch. Two inches. Cutting away. So that in the end, ta da, weaving bases. You'll also need to cut strips of paper one-inch by nine inches to weave through the bases. You'll be using the Center Instruction Card called "Paper Weaving."

Teacher: Now, watch what happens. This is very difficult.

Narrator: Before students go to the center, the teacher introduces the activity to the class and demonstrates the weaving pattern.

Teacher: The next one goes?

Class: Down.

Teacher: The next one comes?

Class: Up.

Teacher: The next one goes?

Class: Down.

Teacher: And the last one goes?

Class: Up.

Narrator: When the students are at the center, they will need additional help to master the weaving process. Most students can handle the over-under part. But it's the alternating pattern that gets tricky. If they make a mistake, though, you can just have them pull the strip out and start weaving over.

This is a challenging activity for most kindergarteners so you may want to invite a few fifth or sixth graders to come help out the students. The woven mats can be displayed on a bulletin board for all to see.

<Investigation 5, Part 3>

Narrator: This is the culmination of the module. In this part, students bring together all of the knowledge they have gained about wood and paper to create beautiful wood and paper sculptures. The choice of materials is up to you. The students could combine a variety of wood and paper scraps to make sculptures or focus in on just paper or just wood. In either case, variety is the key.

For wood scraps, lumberyards, cabinet shops, and high school wood shops are good sources of free, small scraps. One note of caution, however: If you plan to have students nail the wood together, collect pieces of soft wood only like pine.

You'll also want to think about what tools you'll want to provide. The basics are tape and glue and scissors. But there's lots of things you can provide. There's staplers and hole punchers. There's markers and crayons. There's water and droppers. There's wheat paste. There's weaving supplies.

Oh, there's sandpaper. Maybe you want to give them some watered down tempered paint for staining the wood or a cornstarch matrix and wood shavings for making their own wood dough, glue sticks, whatever.

Here is the Center Instruction Card you'll need for this part. This activity is left very open-ended. Students are asked to be inventive and to share their creations when they are finished.

If students are having trouble getting started, make some suggestions to use both materials like boats with sails, houses with roofs, animals with curly paper tails, or fun-looking abstract sculptures.

This girl is making a drum with fancy drum sticks. You may even want to make this an every Friday tradition where you add tools, such as staplers

or hole punchers, for a new twist each week.

Here are some of the words and concepts students might choose to add to the Word Bank and Concept Chart during this investigation. Our goal in kindergarten science is for students to explore familiar objects and events in many ways. Wood and paper are perfect materials for exploration.