

FOSS® AIR AND WEATHER 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 at 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.

<Deanne Giffin Introduction to Module>

Narrator/Deanne Giffin: Hello. My name is Deanne Giffin and I'm going to introduce you to the Air and Weather module. In this module students conduct investigations that develop their curiosity about air and weather. Most of the materials needed are found in these two boxes. We've spread out all of the materials on the table so you can see everything that comes in the kit. There are enough materials for two classes of 32 students. Make sure you check the inventory list to find out which materials are permanent and which are consumable.

The posters on the wall behind me are also included in the kit. In this video we're going to show you all of the steps needed to get ready for the

activities as well as some scenes from students in the classroom. Before you begin teaching, it is important that you read the entire teachers manual.

First you'll find the Overview folio which contains many helpful suggestions for getting started. In it are the national standards that are addressed in this module, background information on air and weather, ideas for organizing your classroom for the investigations, suggestions for scheduling the activities and an overview matrix to help you plan the entire module and integrate it into other areas of the curriculum.

In the Materials folio you'll find an inventory list for the kit, lists of any materials you'll need to provide for the investigations, directions for preparing the materials, and information on ordering any replacements.

The next four folios are the investigation folios. These are the heart of the program. The first page gives overview information. The At A Glance chart summarizes the information and helps you plan for assessments and extension activities. You'll find background information specific to the investigation.

The section called Teaching Children About gives you some insight into the research on how children think and learn. Each investigation has several parts. For each part, you'll find a materials list, Getting Ready section and step-by-step directions for teaching the activity. The interdisciplinary section in the back of the folio has many ideas for extending the investigation.

In the next section are the duplication masters. Here you'll find all the student sheets as well as masters for Math Extensions and mobile Home/School Connections. There are lots of ways to assess your students' learning as they progress through the investigations. Read through the Module Assessment folio at the back of the Teacher's Guide for more information about formative or ongoing assessments, End-Of-Module Assessments, and portfolio suggestions.

After the Assessment folio, you'll find duplication masters to help you with assessments. On the Anecdotal Notes page you can record your students' insights or the difficulties they run into. The assessment checklist is used when assessing specific skills or concepts the students have learned.

In the kit you'll find a class big book and eight student books, the Air and Weather FOSS Science Stories. These are designed to be read periodically throughout the module after students have had hands-on experience. The Science Stories folio in the Teacher's Guide will help you incorporate your stories into your language arts program.

Check out the Resources folio near the back of the Teacher's Guide. This annotated list includes descriptions of fiction and non-fiction books for student reading, videos, software, and teacher resources.

There are a few things you need to get ready that you'll use throughout the module. First you'll need to make an Air and Weather Journal for each student. Make back-to-back copies of the duplication masters. Collate, fold and staple. These journals become an important assessment component of the entire module.

Make copies of the Anecdotal Notes and assessment checklist pages for assessing student understanding during the investigations. I find it easier to write in my students' names before making copies.

Word Bank and content charts are used to help students remember the new vocabulary and concepts they learn as the module progresses. Students will add to these charts at the end of each session.

Make copies of the Letter To Parents duplication master and send these home with your students. The letter states the goals of the module and suggests activities parents can do at home with their children.

Science is always a favorite time in my classroom. My students enjoy the hands-on materials and learn from their discoveries. Their curiosity keeps them thinking about the activities beyond the classroom experience.

<Investigation 1, Part 1>

Narrator: In Investigation 1, students observe properties of the mixture of gases we call air. In Part 1 they begin by observing how air interacts with a number of objects. These are the materials you'll need from the kit:

Balloon pumps, round balloons, zip bags, flex straws, cotton balls, plastic foam balls and feathers.

All you need to provide are a pair of scissors and squares of scrap paper. Notice there are three kinds of straws that come in the kit: Jumbo, super jumbo and flex straws. You'll need the slimmer flex straw for this activity.

To get ready, cut the flex straws in half saving the flexible end for this activity. Assemble a bag of air materials for each student.

This part begins with a discussion about air, what it is and what it can do. Then the bags are introduced and rules for using the objects are discussed with the students.

Teacher: Let's talk about what they are.

Class: Feather.

Class: Cotton ball.

Class: Balloon.

Narrator: The challenge for the students will be to find out all they can about air using what's in the bags.

Class: Bag.

Teacher: Is there anything in this bag?

Class: No.

Teacher: Does anybody think there's something in this bag?

Class: No.

Student: Yes.

Teacher: Chelsea?

Student: Air.

Teacher: How do you know air is in this bag, Chelsea?

Student: Because if you blow in there, there's air.

Teacher: And if you blow in there and there's air, how can you tell there's air in the bag?

Student: Because it's all puffy.

Teacher: Okay. Great. Today you are each going to get a bag of these objects. And you are going to try things out and see what you can find out about air.

There are a few rules before we get started. One thing is that in order to keep us all safe, nobody is going to blow the balloon in their mouth because it's possible to choke on balloons. So we're going to use a special balloon air pump. And it looks like this. You put the pump inside the balloon and you hold onto the top of the balloon and you pull this air back.

Student: Cool.

Teacher: And you pump and it blows the balloon up for you. Now, one very important rule is we will not be letting go of the balloons in the classroom. You may use the balloon to use the air that's inside the balloon.

(Laughter)

Teacher: But you need to hold the balloon and not let it go. Another very important rule is we will not use the straws to blow into other people's faces. You can use the straw to blow other objects when you're experimenting with air. But not other people's faces.

Now the bags for objects for exploring air are on the back table. You will need to get one for each person at your table. And now I need the getters to go get those, please.

Student: It went back there.

Student: Hey, look at mine. Look how cool it is.

Student: You have to go get it.

Student: What is the matter with this thing?

Student: Give it back. Give me it back.

Student: Whoa!

Student: Air is not coming out.

Student: Look if you squish it.

Student: Hey, Jonathan, I see air in Bobby's breath.

Student: You're pumping it up. Okay. That's enough.

Narrator: As with all hands-on activities, you'll want to establish a signal that quickly gets students' eyes and hands away from the materials.

Teacher: Boys and girls, freeze, please. Thank you. This is your two-minute warning. You have two more minutes to find out all you can about air and then we're going to stop and clean up.

Student: Whoa!

Teacher: Okay, boys and girls, freeze, please. Thank you. It's time to stop and clean up. If you have air in your balloon, please quickly let the air out.

Narrator: When the students have had plenty of time to explore their ideas, they return the plastic foam balls and feathers which will go back into the kit. They can keep everything else, including the zip bags. As a pre-assessment for the module, students draw or write what they know about air so far.

Teacher: Chelsea?

Student: Air.

Narrator: The teacher brings the students together to share their observations.

Student: Wind.

Narrator: Now is the time to begin the Word Bank and content charts.

Teacher: And we will be adding to our Word Bank as we learn new words, as we do more activities in this investigation. Next I want to know what you learned. Think about what you learned about air today.

Student: Air can push other things.

Student: Air is invisible.

Teacher: Okay.

Student: Air is gas.

Teacher: Air is a gas.

Narrator: The students will add to these charts as the module continues.

<Investigation 1, Part 2>

Narrator: In Part 2, students explore the concept of air taking up space. This part is designed to be conducted as a center activity. Here is what you'll need from the kit: Vials, plastic foam balls and a basin for each group of four students working in a center. There are enough materials in the kit for four centers. You need to provide water, paper towels and a paper cutter or pair of scissors.

To get ready, cut the paper towel in fourths and fill the basin with water. Each student may be using as many as four paper towel squares. Keep the roll handy for spills.

If you have an assistant or parent working with the students, make a copy of the Center Instruction Card. This will help your assistant guide the students. To begin, students find out what they can about air using vials and water.

Student: Air comes out of this and makes bubbles.

Student: The air comes out when I dump it in the water.

Narrator: After some initial exploration, students are given foam balls. The balls help see the water levels in the vial as it is pushed under water and tipped.

Teacher: Put it right straight over it. And watch what happens. Where is the Styrofoam ball? Can you see it? I can't see it.

Student: I can.

Student: I can.

Teacher: Where is it? Tell me about it.

Student: It's under there.

Teacher: It's on the bottom of what?

Student: Of the Styrofoam.

Teacher: It's on the bottom of the vial?

Student: The vial.

Teacher: Now tilt it sideways. There we go. Now everybody gets to try that. Here are some Styrofoam balls. And remember, the Styrofoam ball floats on the surface of the water. Look on the side of the tube. And where is the ball?

Student: Under it.

Teacher: It's on the bottom. So is that water or air in there?

Student: Huh?

Teacher: Is that water or air inside your vial because it's sitting on the bottom there?

Student: Water.

Teacher: The ball is sitting on the water. So is it -- the stuff that's in the vial on top of the ball, what is that?

Student: Air.

Teacher: Air. If you tip it just a little bit while it's under water -- tip it sideways --

Student: Not like that.

Student: See.

Teacher: Good.

Student: I got a bubble, too.

Teacher: Okay, now I've got another question for you. Wait a minute. It's had air. And the air came out in the bubble. And then what did the vial fill up with?

Student: Water.

Teacher: Water. Because the air was gone. Okay. Good.

Narrator: Once the students understand there is air trapped in the vials, they are challenged to keep a paper towel dry under water.

Student: Okay. Can you help me?

Teacher: Really stuff it down there.

Student: Mine is wet.

Student: Oh, I did it. Mine is dry.

Student: Mine is wet.

Student: Hey, look, I did it.

Student: It's not wet.

Student: There's air in the bubbles and right there is the air.

Narrator: Students record in their Air and Weather Journals what they learned about air from their explorations.

Teacher: Tanner?

Narrator: As with every session the activity ends with a discussion summarizing what was learned.

Student: And then when you put it in really fast, there's some water. But it stayed dry a little bit.

Teacher: Well, why do you think it stayed dry?

Student: Because some air was on it.

Teacher: So there was air in the vial with the paper towel?

Student: Yeah.

Teacher: Okay. How many of you were able to make bubbles in the water? Okay. Good.

Narrator: The teacher adds new vocabulary to the Word Bank and ideas to the Content Chart.

Teacher: Okay.

<Investigation 1, Part 3>

Narrator: In Part 3, students construct and fly parachutes as an introduction to the concept of air resistance. Here is what you'll need from the kit: String, jumbo paper clips, sticky dots and a roll of tape in case the parachutes rip. You'll need to provide scissors and napkins. The inexpensive light weight kind are best.

Before starting this activity, you need to cut enough 45 centimeter pieces of string so that each student gets four pieces. An easy way to do this is to cut a piece of cardboard 45 centimeters long, wrap the string around it and then cut the ends. And while you've got the scissors out, cut a strip of five sticky dots for each student.

You'll want to practice making the parachute before demonstrating it for the class. First, attach a string to each corner of an unfolded napkin with a sticky dot. Then gather up the strings and put them through the paper clip. You'll connect them with the last sticky dot. There's your parachute.

After a discussion of parachutes and a demonstration of how to construct one, students get the materials and go to work.

Teacher: Take a look and see.

Student: Cool.

Teacher: Now, why doesn't that just fall right to the floor? What's

keeping it up in the air so it kind of flows down gently?

Student: This.

Teacher: What is it?

Arianna? What is keeping it up?

Student: Because it's light.

Teacher: Because it's light. So if it was something heavy, it wouldn't come down so slowly?

What else do you think, Maddie?

Student: Um, because of the air.

Teacher: Where is the air?

Student: It's -- it's going in here and making it go down slow.

Teacher: Air gets in the way inside the napkins.

Narrator: And the teacher explains that for the parachute to fall, it must push the air below it out of the way. The air pushes back on the parachute and makes it fall slowly. When any object moves through air, it is slowed down by what we call air resistance.

<Investigation 1, Part 4>

Narrator: In Part 4, students work with syringes and flexible plastic tubing to continue their investigation of the properties of air. All you need are the syringes and flexible tubing from the kit. Each student gets one syringe and one piece of tubing. The students are challenged to use the new tools to find out what they can about air. No additional guidance is provided.

Student: Look at this. I pushed it. Oh!

Student: Hey, guys --

Teacher: What happens when you pinch the tube?

Student: I want to try.

Teacher: What's happening?

Narrator: After about ten minutes students start working with a partner. Most students will discover the fun of connecting two syringes together with the tubing. You don't want to show them, though, unless they are completely stumped.

Student: Here, look.

Narrator: As the teacher visits the groups, she introduces the terms pressure and compress into the conversations.

Teacher: Compress all the air into one syringe. Lay it flat. Can you compress all the air into one syringe? Can you do that? All of it into one? Oh, that really compressed the air, didn't it?

Student: Ow!

Teacher: Is that hard to do, getting all the air in one?

Student: Yeah.

Teacher: I want to know what happens when you put too much pressure on. What happens?

Student: I blow it out.

Student: It comes out because the air can make the little tube go off because the air pushes it so off it can't --

Student: Blow.

Teacher: It happened, didn't it?

Student: Oh!

Teacher: I heard lots of poppers. We need to stop for just a minute and remind each other, be sure it's not pointing in the direction of anybody. You know why?

Student: Why?

Teacher: Because when it shoots, where would it go? We don't want it to land in somebody's face. It needs to be facing in a direction that's not at a person.

Okay. What's happening to the air inside when I'm pushing on it? All right?

Ahmet?

Student: It's taking this thing and pushing the other one.

Teacher: All right. Mark?

Student: The air doesn't like to be in the little tiny spot so it's pushing the other one to have more room.

Teacher: Okay. Good. I want to know if the amount of air in here is going to change.

Ready, Mary? How many think the amount of air in here changes? All right.

Jessica, do you think the amount of air in here changes?

Student: Yeah, when you push it, first it -- when you push it together, first it gets smaller and smaller. And when you let go together, then it gets bigger, more space.

Teacher: When you're pushing air together and making it go into a smaller space, you're compressing it. Can you say that word for me?

Class: Compressing it?

Narrator: These terms and others are added to the Word Bank after the activity.

<Investigation 1, Part 5>

Narrator: In Part 5, students use a syringe and bottle system with water to find out more about the properties of air. Here is what you need from the kit: Syringes, rubber stoppers, plastic tubing, short plastic pipes, long plastic pipes, vials, plastic bottles and food color. You'll need to provide a pitcher for water or you can use a basin from the kit. You'll also need paper towels for mopping up spills.

Before you begin, add two to three drops of food coloring to a liter of water. It's a good idea to practice assembling a syringe and bottle system before introducing it to the class. First put the plastic pipes through the holes in the rubber stopper. Then put the stopper loosely in the bottle and adjust so that the long plastic pipe touches the bottle. Now you can firmly push the rubber stopper into the bottle add the flexible tubing to the top of each pipe. Then add a syringe to the end of each piece of flexible tubing.

This is your completed syringe and bottle system. Practice using the system following the suggestions listed in the Getting Ready section.

Part 5 begins with a review of what students learned about air in Part 4. The terms compress and pressure are reviewed. The students are shown the syringe and bottle system. The teacher demonstrates how to put it together, distributes one to each pair of students and they get to work.

Student: How come we can't do it?

Teacher: All right, now after you get them connected, you may each suppress through the syringes and see what happens.

Student: Nothing.

Student: It works.

Student: It works.

Narrator: After a few minutes of exploration, the teacher suggests adding a half vial of water to each system. Students remove one of the syringe plungers and use the barrel as a funnel.

Student: It's slowing going. Slow but steady.

Narrator: You'll enjoy the students' puzzlement as the water trickles very slow down into the bottle or doesn't move at all.

Student: There.

Teacher: Why do you think the water is not going down? Think about it.

Student: I don't know. Well, maybe not.

Teacher: What do you need her to do? Tell her what to do.
Go ahead and tell her, Kelly.

Student: Watch it.

Student: Oh, look.

Student: Look, it's all the way down.

Student: Because I was pulling it.

Student: You have to pull it.

Teacher: What did you -- Kelly, what did you need to do so the water could go down

Student: You had to pull it.

Student: Hey, can I put it in now?

Student: Oh, my gosh; oh, my gosh.

Teacher: Now, have you got any idea what you can do so the water will go down in there a little more quickly?

Student: Shake it.

Teacher: Shake it? All right. Try it. Back it out. What else can you do?

Student: That is so neat.

Student: You just pull it up.

Student: Oh, my gosh.

Student: Look, Mrs. Strom.

Student: Put it back in.

Student: I always wanted to do this, but my Mommy wouldn't let me.

Student: I want to do this side.

Student: If you pick it back up, it goes back up.

Teacher: She needs her plunger in.

Student: I want to do this one, too.

Student: Now I don't get any.

Student: Oh, I get it. Because mine is the shorter stick.

Student: It's not a solid. That's what I can tell you.

Student: If it's not a solid, then what is it?

Student: It's a liquid.

Narrator: After about 20 to 30 minutes of exploration, all the materials are collected and students gather for a discussion. You'll need a syringe and bottle system available for students to show off what they've discovered.

<Investigation 1, Part 6>

Narrator: In Part 6, students set up a balloon rocket system and see how far the air in the balloon carries the rocket along the flight line. Here is what you'll need from the kit: Oblong balloons -- one for each student plus a few extra -- four jumbo straws, four four-liter bags, one one-liter bag, transparent tape, duct tape, fishing line and balloon pumps. All you'll need to provide are a permanent marker for writing names on balloons, scissors and some chairs.

You'll need to set up flight lines for the balloon rockets. The instructions in the Teacher's Guide describe how to do this. This is a good activity for a large space such as a multi purpose room. After a discussion of balloons and rockets, the teacher demonstrates the balloon rocket to the class.

Teacher: Okay. Are you ready?

Student: It's going to go back.

Teacher: You think it will go all the way to the end and come back?

Student: Let's do it.

Teacher: Let's see.

Narrator: Balloons are distributed and students organize at the flight lines where they take turns pumping up and releasing the balloon rockets.

Teacher: Okay. Let's see it.

Narrator: Each student should get two or three turns. The word propel is introduced to describe how escaping air pushes the balloon along the flight line.

Teacher: That propels the bag.

Student: Because it had too much air. And then the air blows out faster.

Teacher: But what is it that propels it? What makes it go?

Student: The air.

Teacher: The air in what?

Student: The balloon.

Teacher: The air in the balloon made it go. The air in the balloon propelled it to the end.

Student: Mine went all the way over to the end.

Teacher: See, I've got a lot of air. So I'm going to put this inside here. And then what do you think is going to happen?

Student: Nothing.

Teacher: All raise your hands.
What do you think is going to happen, Martele?

Student: Nothing.

Teacher: Why not? The last time we put something full of air in here it went down to the end.

Student: A balloon.

Teacher: Why don't you think that's going to happen to this one?

Student: Because that's closed.

Teacher: Because it's closed, no air escapes. What if I let some air escape? Then what will happen.

Tammy?

Student: If you let the whole air go out, then it will just go.

Teacher: You think it will go? And will it go as far as the balloon?

Student: No.

Teacher: Raise your hands to tell me the answer to these questions, please. So what's going to happen?

Kabon?

Student: Nothing.

Teacher: Nothing is going to happen?

Student: It's just going to move from here to here.

Teacher: You think it's going to move but not very far?

Brandon?

Student: Because the balloons carry more air than the bag.

Teacher: The balloon carries more air so it propels it further? Okay.

Student: Oh . . .

Student: You didn't open it.

Teacher: I did. I opened it a little tiny bit.

Student: Oh, I know why. The plastic bag isn't elastic so it won't stretch big and spit out the air.

Teacher: So what you're telling me is that because it's elastic, you stretch it out and when the air comes out --

Narrator: To end the session, students are asked how far they think a balloon would travel if it were let go outside of the zip bag. Then they go outside with their labeled balloons. When you say go, students release their balloons. Everyone finds their balloon and stands next to it to see how far it traveled.

This ends the first investigation. Here are the important science concepts that students have been introduced to so far: Air is matter. Air is a gas. Air takes up space. Air can move objects. Air is all around objects. Air resistance affects how things move. Air can be compressed. And the pressure from compressed air can move things.

Now that the students have had experience with these concepts, you can introduce the Science Stories. Your students will naturally be curious to learn more through reading these and other books.

<Investigation 2, Part 1>

Narrator: In Investigation 2, students begin looking at the conditions of the air outside, what we call weather. They monitor and record weather conditions and learn to use a number of weather instruments.

In Part 1, the weather calendar is introduced and students make journal entries about the days' weather. From the kit you'll need two class calendars and a roll of transparent tape. You'll need to provide a watercolor pen, envelopes, a pair of scissors, pencils and crayons.

There are four blank laminated calendars in the kit. You need to write in the dates ahead of time or do this as part of the class introduction. Be sure to use a water based or dry erase pen. Don't use a permanent marker.

Make three copies of the Weather Symbols duplication master. Students will use these symbols for recording weather on the calendar. Symbols for overcast, rainy, snowy, sunny and partly cloudy are included on the master. Students may want to create additional symbols for different kinds of weather such as hail, sleet, fog or thunderstorms. There's a blank row at the bottom of this master for drawing new symbols. Store the symbols in labeled cups or envelopes and place them with the calendar.

Part 1 begins with a trip outside to feel the air and look for evidence of air

movement. Back inside students brainstorm a list of words that describe the weather.

Teacher: Foggy.

Trayon?

Student: Freezing.

Teacher: Freezing. There are a lot more words. But --

Student: Can we do thunder for the last one?

Teacher: All right. We'll do thunder for the last one.

Student: What about wind?

Narrator: The teacher introduces the term meteorologist as a person who studies the weather. Then a class calendar is introduced as a tool for keeping track of the weather. The class agrees on the day's weather and the teacher demonstrates how to place the appropriate symbol on the calendar. Everyone will get the chance to be the class meteorologist over the next few weeks. The meteorologist will be responsible for placing the appropriate weather symbols on the class calendar.

Next the teacher models a journal entry using the students' descriptions of the day's weather. Students then write their own descriptions in their Air and Weather Journals. They will be adding different aspects of the weather such as wind speed and temperature to their journal entries as you progress through the next activities.

Students at this age often use imaginary description in their journals that depict their wishes but not reality. For example, it may be a gray cloudy day but some students will draw and describe rainbows and sunshine. This is a good opportunity to discuss the difference between scientific and personal journals.

<Investigation 2, Part 2>

Narrator: In Part 2, the thermometer is introduced as a tool for measuring the temperature of air and students make model thermometers to practice reading temperatures. From the kit you'll need two basins and both thermometers. You'll need to provide crayons, glue stick, ruler, roll of transparent tape, scissors, and construction paper cut to the size as

specified in the Teacher's Guide.

You'll find two different kinds of thermometers. One is a demonstration thermometer with Fahrenheit on one side and Celsius on the other. You'll also find a smaller working thermometer which has a Fahrenheit and Celsius scale side by side. You'll need to decide ahead of time which of these scales you'll be using.

If you are the first person to use the kit, you'll need to color code the demonstration thermometer. Students use the colors to help them associate temperatures with how air feels. Use colored paper to code the temperatures following the directions in the Teacher's Guide. Tape these in place being careful not to catch the adjustable strip. At the same time you'd need to cover up one side of the working thermometer.

Make copies of the duplication master called Thermometer Picture for students to use in making their own model thermometers. These are available in Celsius and Fahrenheit. Use the one that matches your demonstration thermometer.

Here is how your students will make a model thermometer. First have them color code the temperatures to match the demonstration thermometer. Then you need to cut out the center. To do this, fold it in half. Make the first cut in order to get the scissors into position. Then carefully cut around the line.

Next you'll put glue along the two long edges. It's very important to go just in the space right next to the edge so that the red strip will be able to slide through once it's assembled. Mount the thermometer on the light colored construction paper. Then you're going to attach the small red rectangle to the large red rectangle to make a handle. Now insert the red strip into the thermometer.

Consider having students put together meteorologist toolkits to store the model weather instruments they will be making. On each page students describe how to use one of the weather instruments. There is a pocket on each page to store an instrument.

In the front of the toolkit there is also a pocket for storing the Air and Weather Journal. When completed students take these home to share with their families. Details for making the meteorologist toolkit can be found in the Interdisciplinary Extensions section of Investigation 2. These

duplication masters for the meteorologist toolkit can be found near the back of the duplication masters section of the Teacher's Guide.

This part begins with a discussion about temperature and a demonstration of how the thermometer works.

Teacher: Kevin?

Narrator: The thermometer is placed in hot and cold water as the students watch the red line go up and down. Then it's time to go outside and feel the air.

Teacher: Tammy, what do you think? Is it warmer outside or cooler than our classroom?

Student: Cooler.

Teacher: I couldn't hear you.

Student: Cooler.

Teacher: Cooler.

Narrator: The teacher introduces the demonstration thermometer and points out the color coded temperature ranges. The meteorologist of the day reads the outside temperature.

Teacher: Does that match?

Narrator: Back inside students read the indoor temperature and decide whether the red line of the demonstration thermometer should go up or down. Then they go to work making their own model thermometers and practice reading temperatures.

Teacher: Yeah. Just right along this edge there. Can you see that line there? Just a tiny bit.

Narrator: Each day the class meteorologist will take the working thermometer outside as part of his or her job. Once outside it takes about two minutes for the thermometer to reach air temperature. After the temperature has been reported, you'll address the red tape on the large demonstration thermometer to show the day's temperature.

<Investigation 2, Part 3>

Narrator: In Part 3, students look at different cloud types and discuss how moving air, the wind, moves clouds across the sky. All you need from the kit is the poster A Guide To the Sky and sticky dots. Sticky dots are used to highlight examples of clouds on the poster. Use Picture 1D for cirrus, 4D for stratus and 5D for cumulus. Make copies of the student sheet called Cloud Types for each student and you're ready.

Student: Some look white and some look gray.

Student: And it's big and puffy.

Teacher: Okay. Great.

Narrator: This part begins with a discussion about clouds and different types of clouds students have noticed. Each student gets a Cloud Types sheet describing three basic types. High, wispy cirrus clouds, big fluffy cumulus clouds and low gray stratus clouds. The A Guide To the Sky poster provides the class with photos of these three classes and many variations.

Teacher: Now where do you see the cirrus clouds?

Narrator: Then the class goes outside to watch clouds and discuss how they move.

Teacher: As an ocean, it's kind of like that, the waves in the sky.

Student: Hey Kevin! It looks like them. Like this.

Teacher: Oh, you see the fluffy white part up at the top. It's a cumulus cloud. Can you see a stratus cloud anywhere? A cloud that looks like it might rain?

Student: I think so.

Teacher: You think so? I'm thinking that over there it looks like a stratus cloud where the gray is at the bottom. Do you agree or disagree?

Student: Agree.

Teacher: Really? Okay.

<Investigation 2, Part 4>

Narrator: In Part 4, students set up a rain gauge to measure rainfall. From the kit you'll need the rain gauge and two posters, A Guide To the Sky and Natural Sources of Water. This rain gauge can be inserted directly into the ground or attached to a post with screws. Either way you'll be able to remove it easily.

The rain gauge comes marked for both millimeters and inches. Decide beforehand which scale you're going to use and cover the other side with a strip of paper. Then tape it down.

With the duplication masters, you'll find instructions for how to make a rain gauge out of a two liter soda bottle. Here is what this rain gauge looks like. You can make one of these for your classroom or make copies of the master to send home with your students.

Part 5 begins with a discussion of the kinds of clouds students have observed when it rains. The rain gauge is introduced and with the teacher's help students decide where to place it. A good spot is an open area with no overhang so it's easily accessible to the students. It should also be a site where the rain gauge won't be disturbed.

After each rainstorm the meteorologist will bring in the rain gauge so the class can observe the amount of rain that's accumulated. Students record this in their journals along with the temperature and weather conditions. You can use the Natural Sources of Water poster to discuss where water gathers and is stored.

This concludes Investigation 2. Here are the concepts that students have been introduced to through the investigation: Weather is the condition of the outside air at a given time. Temperature describes how hot or cold the air is. Clouds are made of water drops and form in the sky. There are different kinds of clouds. Wind moves clouds. Rain is water that comes from clouds.

<Investigation 3, Part 1>

Narrator: In Investigation 3, students use a variety of tools to observe the speed and direction of moving air. In Part 1, students use bubbles to look for evidence of moving air. From the kit you'll need the bubble wands and the tubs. You will need to provide dishwashing detergent, a two liter

bottle of water with a cap. A measuring cup and a teaspoon. Optionally you can add corn syrup or glycerin. When making bubble solution, add the soap and corn syrup or glycerin last. Then gently swirl and tip the bottle. The reason for swirling it gently is you don't want to get a lot of foam at the top.

Teacher: We'll be doing some experimenting with --

Narrator: Part 1 begins with a discussion of what is inside and outside a bubble and how bubbles move around. Bubbles are proposed as a tool to see where air is moving.

Teacher: Now, when you blow a bubble, you're going to watch it today. And watch the direction that they are going in.

Narrator: The teacher distributes paper cups, solution and bubble wands and lets the exploration begin.

Teacher: Which way is the air going? What do you think?

Class: That way.

Teacher: Let's fill the air with lots of bubbles. After you blow a bubble, point which direction it goes.

Narrator: Groups of students are challenged to use bubbles to find out where the air moves fastest, slowest and what happens to the air when it moves near walls, corners and doorways.

Student: Because the bubbles are going that way.

Teacher: Show me. Oh, it went that way. Which way is the wind blowing?

Student: That way.

Teacher: How can you tell?

Student: The wind is blowing at me.

Narrator: When you return to the classroom, students review what they observed about the flight of bubbles.

<Investigation 3, Part 2>

Narrator: In Part 2, students learn methods for describing and measuring wind speed. Here is what you need from the kit: A wooden base, a cardboard square with a hole in the center and slits on each side. Four plastic cups, a jumbo straw and a super jumbo straw. You'll need to provide a fan or hair drier, permanent marker and scissors.

To get ready, you'll need to make the class anemometer. Insert one cup all the way into each slit on the cardboard square. This will be easier if you cut the rolled lip where you slide it on the cardboard.

Next, cut a one centimeter slit in the end of a jumbo straw. Then insert the straw through the hole in the cardboard. Spread the ends flat and then tape them in place.

Then you need to cut about five centimeters off the end of the super jumbo straw and insert the long piece into the wooden base for your anemometer. Then insert the jumbo straw into the super jumbo straw. Then you'll need to make a black mark as a reference point. And now your anemometer is ready to use. All righty.

After discussing wind, the teacher introduces the wind scale poster. The different terms, no wind or calm, gentle breeze, moderate breeze and strong breeze and the descriptions that go along with them are explained.

The anemometer is introduced as an instrument that measures the speed of the wind. After students have practiced counting the rotations the anemometer makes in ten seconds, they take the anemometer and wind scale sheets outside to measure the wind sheet.

Student: Stop.

Narrator: Back in the classroom students record the day's wind conditions and temperature in their Air and Weather Journals.

<Investigation 3, Part 3>

Narrator: In Part 3, students make pinwheels and compare them to the class anemometer. Here is what you'll need from the kit: Hole punchers, jumbo straws, super jumbo straws cut in half and rolls of transparent tape. You'll need to provide crayons or markers, scissors and portable wind in the form of a fan or hair drier. Use the Pinwheels Pattern sheet to make

copies of the pinwheels for your students. Each sheet has two pinwheels for two students.

Before beginning the activity, cut apart the pinwheel so they are ready for the students. Students cut the pattern out, punch holes in it and thread a jumbo straw through all of the holes. The straw is split at one end. The split end is folded out and taped to the end of the pinwheel. When the jumbo straw is inserted into half of the super jumbo straw, the pinwheel can rotate.

Teacher: Give the other two a chance.

Narrator: Once the pinwheels are assembled, the class takes them outside to look for evidence of moving air.

Teacher: Gentle breezes.

Student: Gentle breezes.

Teacher: Yeah. So what do you think would happen to your pinwheels if you had strong winds?

Narrator: Brief interviews at this time will help you assess student understanding.

Student: Some might blow away like that.

Student: Mine can push away.

Teacher: So what's making them turn?

Class: The wind.

Teacher: How come sometimes they don't turn?

Student: No wind.

Teacher: No wind. Yeah. So this is a good thing to figure out if there's wind. It's a good tool for measuring wind. Are you able to count fast enough to see how many times it's going around? It's going around very fast right now.

<Investigation 3, Part 4>

Narrator: In Part 4, students make and use wind vanes to help them observe wind direction. Here is what you need from the kit: The other wooden base, super jumbo straws, some of them cut in half, jumbo straws, hole punchers and rolls of transparent tape. You'll need to provide portable wind, 12 centimeter strips cut from a sheet of poster board, scissors and optionally a compass.

To get ready you need to make the pointers and tails for the wind vanes. An easy way to do this is with a paper cutter. Start by marking in five centimeters from one end of the 12 centimeter strips of poster board. Cut from the five centimeter mark to the corner. Then flip it over and mark in ten centimeters. Cut from the ten centimeter mark to the point. Flip the paper over again. Mark in another ten centimeters and cut again. Keep going until you have enough triangles for each student. Take the triangles and cut them in half. This makes your pointer and tail for your wind vane.

To make a wind vane first punch a hole in the middle of a super jumbo straw. Next you need to make vertical slits in each end. An easy way to do this is to put your finger over the hole punched hole and make a vertical cut in each end of the straw. These need to be in line with the hole.

Next you need to make a cut into the end of a jumbo straw. And the other end of the jumbo straw is inserted through the super jumbo straw. Then you'll fold down the flaps, line it up with the straw, and tape it in place.

Insert your pointer in one end and your tail in the other. When students make their wind vanes, they'll insert the jumbo straw into a half of a super jumbo straw. For the class demonstration wind vane, you'll need your wood base and cut approximately five centimeters off of a super jumbo straw and insert it in the base. Then you insert the jumbo straw and your wind vane is done. To help the pointer and tail hold up in the wind, secure them in place with a piece of tape.

Teacher: This afternoon we're going to work together to make a simple tool called a wind vane.

Narrator: After the teacher introduces the class wind vane and demonstrates its construction, the students go to work.

Teacher: Take a long red straw, a short red straw and a clear straw.

Student: Look at mine.

Student: Let me show you. See this, it has a little cut. So you like do this -- let me show you. You put this on like this.

Student: Tape it or it will come off.

Teacher: Blow.

Student: It's supposed to be taped?

Student: Yeah.

Narrator: They can use a fan or hair drier to test out their wind vanes when completed.

Teacher: You're going to need to use two hands. One hand it going to be a rest. Your other hand is going to hold the big striped straw on the bottom. That way your wind vane can spin freely. Okay? It needs to be straight up and down. Look around at everyone's wind vane and you will see something that's the same about all of them. Use your eyes to look.

Student: They are all going that way.

Student: They are all going what way?

Teacher: They are all pointing in the same direction. Who said that? You're right. They are all pointing in the same direction. The arrow is pointing where.

Class: That way.

Teacher: And what's coming from that way.

Class: Wind.

Teacher: That's right. The air is moving from the point toward the tail.

Narrator: Some students will think the arrow of the wind vane shows the direction where the wind is going to. They can observe the movement of clouds, leaves or flags to help them sort out where the wind is coming

from and going to.

<Investigation 3, Part 5>

Narrator: In Part 5, students make kites. They use the class anemometer and wind vane as guides to help them fly their kites. Here is what you need from the kit: Crepe paper cut into strips, hole punchers, jumbo straws, string and rolls of transparent tape. You'll need to provide automatic wind, crayons and scissors.

There are patterns for two kites in the teacher's guide. Kite 1 is easier to make. It has two strings and does not require the straws. Kite 2 is more difficult to make. However, my students enjoy this one a lot. You do need the straws for this kite. And it has just one string.

The instructions for Kite 2 are printed on the pattern. First fold on Line 1 along the dotted line. Then you're going to fold down Line 2 and then fold down Line 3. Next put a piece of tape on No. 4 in the middle. At No. 5, you'll tape a straw. It's one of the jumbo straws that you've cut to 14 centimeters. And you'll tape it at both ends. And tape the middle.

Next you'll fold down the corners marked 6 and 7. Now attach the crepe paper streamers for the tail. They are marked No. 8. For the last step, turn the kite over and reinforce the bottom where you're going to hole punch for the string. So put a piece of tape over it. Punch through it. And attach your string. This piece of string is approximately 190 centimeters. Tie it on and your kite is ready to fly.

After discussing how kites fly, the teacher demonstrates how to make a kite. Students first try out the kites in the classroom. Then on a breezy day, they go out with the wind vane, anemometer and kites for some free flying fun. The challenge is to keep the kite flying without running.

Teacher: Hey, look at that one.

Narrator: At the end of Investigation 3, students should be familiar with these concepts: Wind is moving air. Meteorologists use several tools to observe the wind. A wind scale describes the strength of the wind. Anemometers measure the speed of the wind. Wind vanes are used to observe the direction of the wind.

<Investigation 4, Part 1>

Narrator: Investigation 4 has students looking for changes in the weather

over the course of a month, season or entire year. They also look for changes in the night sky over a period of a lunar cycle. In Part 1, students organize information gathered on the class weather calendar over the last four weeks.

You need to create a new duplication master for this part before starting. First make a copy of the duplication master called Weather Record. Then use the weather symbols to replicate the class weather calendar gluing or taping the symbols in place. Make one copy of the Weather Record for each student.

You'll also need to make one or two copies of the duplication master called Weather Graph for each student. They may have to tape two graphs together if the weather symbols fill more than one column.

Teacher: Overcast.

Narrator: This part begins with a discussion about the weather recorded on the class calendar. Students are challenged to determine if there were more sunny days than another type of weather, such as rain or snow. Then graphing is introduced as a way to organize the data and compare the number of days each type of weather was recorded.

The teacher demonstrates how to construct the graph. Then students cut the symbols apart and use them to construct a graph showing how many days of each type of weather there were during the previous four weeks. Once completed, students discuss the information on the graph and make predictions for the next month.

Teacher: Look at the graph. What kind of weather did we have the most of?

Student: This one and that one.

Teacher: What are those two? What is this, this one?

Student: Overcast and sunny.

Teacher: Overcast and sunny. What did we have the least of?

Student: Rainy.

Teacher: Could you point to that? Okay. The least -- we had the least number of days of rain, huh? Was it easy to read then and tell me from the graph than from that calendar we had? Is it easier to see it this way?

Student: Uh-huh.

Teacher: Because on the calendar it was all mixed up.

Student: Yeah.

Teacher: But it's easy to see when you organize it on the graph.

Student: Yeah.

Teacher: So now you can tell me just like that what we had the most of.

<Investigation 4, Part 2>

Narrator: In Part 2, the class monitors the weather, temperature and rainfall on seasonal charts throughout the school year. The graphs are compared at the end of each season. If you need to pass the kit onto another teacher, you will need to provide an outdoor thermometer for the class. Use the rain gauge you made out of the two liter bottle or make one now. The same instrument without the funnel makes a useful snow gauge.

To make the Weather Conditions graph, glue or tape two or three copies of the Weather Graph end to end. Then cut a strip from the graph category sheet and attach it to the bottom row. Label the graph Conditions.

The Temperature graph is made in much of the same way. Depending on the rainfall where you live, you may only need one copy of the precipitation record. If you do add another copy, be careful to cut the second sheet above the bottom oval so you have five rows between labels. You will also need to cut strips of blue construction paper and keep scissors and tape near the chart.

This is an ongoing investigation which begins with a discussion of the movement of the sun across the sky. Using a newspaper weather report, the teacher asks students why they think a high and low temperature is given for each day. Then the class decides what time of day they will take daily temperature readings.

Each day the class meteorologist makes an X on the Conditions graph and

another on the Temperature graph. With each rainstorm, the meteorologist measures the rainfall, holds a paper strip against the gauge, and cuts it to size. This strip is placed temporarily on the Today column. On another day the strip is added to the Total column.

Student: Oops.

Narrator: Each set of graphs is used to record the changing weather throughout the seasons. At the end of each season, the graphs from the previous seasons are brought out and compared to the new ones. Students look for patterns in the kinds of temperatures, precipitation and weather that are characteristic of each season.

<Investigation 4, Part 3>

Narrator: In Part 3, students extend their observations of air and weather to the night sky. To get ready, make copies of the Night-Sky Letter To Parents and the Night-Sky Log for each student and a few extras to have on hand.

Make a copy of the moon calendar for the class and two copies of the Cut-And-Paste Moons sheet. Cut apart the pictures of the moons, sort them and store them in labeled cups or envelopes near the calendar.

Scheduling this part will be important. Consult the newspaper or the web site listed in the Teacher's Guide for help in determining the dates of the moon phases. It's best to start with the moon in the third quarter, which is when you will be able to see the moon during the day. The class goes outside to observe objects they see in the sky.

Teacher: Let's examine the sky. See if you notice something.

Class: The moon.

Teacher: You see the moon? Do you normally see it in the daytime sky?

Class: Yes.

Teacher: I hear someone else. Ryan, you say you see it at nighttime?

Student: I see it at nighttime.

Teacher: Oh the sun is right there. Yes; yes. Well, what I'm wondering is

does the moon always look like that?

Class: No.

Narrator: After a discussion about the moon, the moon calendar is introduced as a way of recording their observations for five weeks. On the first quarter moon, students will be able to view the moon in the early evening. This is the time to send home the sheet that students complete with their parents.

Student: The moon kind of looks like there's four quarters -- four quarters of the moon. And the clouds are like moving right past it.

Narrator: At home they'll make observations of the weather at night and the appearance of the moon every evening for a week.

Student: The temperature, I think it's 57 because it's right in the middle of 56 and 58.

Parent: What did the moon look like tonight?

Student: It looked like this.

Parent: And do you remember what the temperature was?

Student: Uh-huh.

Narrator: After a week the moon should be full. In the classroom the students discuss any patterns they have noticed. Wrap up the investigation on a third quarter moon when it is once more visible during the day bringing it full cycle.

Students should understand these concepts at the end of Investigation 4: Weather conditions change over time. Weather observations can be organized and compared. The sun heats the earth during the day. The bright appearance of the moon changes shape in a pattern that can be observed, compared and predicted. The sun and moon appear to move slowly across the sky.

This is the end of Investigation 4. Throughout the investigations in the Air and Weather module students have observed the properties of air and its effect on objects. They have observed daily weather and recorded their

observations while gaining vocabulary to help them communicate their discoveries. These experiences further contribute to their understanding and wonder of the physical world in which they live.

Student: Well, you can see patterns in the stars.