

TEACHER'S MANUAL

This Suitcase Program provides the materials and lesson plans for teachers of grades 6-8 with content and activities increasing in difficulty by grade level. Activities in this Suitcase Exhibit may assist in meeting the Tennessee State Standards.

ACTIVITIES

ACTIVITY I: Weather and Weather Forecasting	2
ACTIVITY II: The Water Cycle	3
ACTIVITY III: Wind	5
ACTIVITY IV: The Greenhouse Effect in a Jar	6
ACTIVITY V: Tornadoes	7
INVENTORY CHECKLIST	8

TENNESSEE STATE STANDARDS FOR 6-8

6.LS2.6	Research the ways in which an ecosystem has changed over time in response to changes in physical conditions, population balances, human interactions, and natural catastrophes.
6.ESS2.5	Analyze and interpret data from weather conditions, weather maps, satellites, and radar to predict probable local weather patterns and conditions.
6.ESS2.6	Explain how relationships between the movement and interactions of air masses, high and low pressure systems, and frontal boundaries result in weather conditions and severe storms.
7.ESS3.1	Graphically represent the composition of the atmosphere as a mixture of gases and discuss the potential for atmospheric change.
7.ESS3.2	Engage in a scientific argument through graphing and translating data regarding human activity and climate.

For the entire activity and materials and to reserve a Suitcase Exhibit, please call 901.636.2362.

ACTIVITY I: Weather and Weather Forecasting

DURATION OF ACTIVITY: 30-minute lesson on weather, 60 minutes on weather instruments and forecasting, and 30 minutes each day thereafter to record the weather conditions

LESSON OBJECTIVES

Students will use a combination of weather instruments to forecast weather and record their observations.

GUIDING QUESTIONS

What causes the weather? What tools and information do meteorologists use to forecast the weather?

TENNESSEE STATE STANDARDS

- 6.ESS2.5 Analyze and interpret data from weather conditions, weather maps, satellites, and radar to predict probable local weather patterns and conditions.
- 6.ESS2.6 Explain how relationships between the movement and interactions of air masses, high and low pressure systems, and frontal boundaries result in weather conditions and severe storms.
- 7.ESS3.1 Graphically represent the composition of the atmosphere as a mixture of gases and discuss the potential for atmospheric change.

MATERIALS INCLUDED

Poster, "Clouds"
Poster, "Types of Precipitation"
Poster, "Weather Forecasting Map"
Poster, "The Earth's Atmosphere"
Poster, "Cloud Chart"
Poster, "The Water Cycle, Nature's Recycling System"
1 Six-Way Weather Meter, on stand, with clamp
1 Demonstration Thermometer
12 Plastic Laboratory Thermometers
5 digital thermometers
10 Sling Psychrometers
2 Dial Barometers and 1 Hygrometer
1 Wind Wizard Wind Speed Indicator
1 compass
1 Anemometer
Notebook: Weather: Transparencies, Activities and Teaching Guide, Milliken Pub. Co.
Book, *The Kids' Book of Weather Forecasting*
Book, Rupp, Rebecca. **Weather!**
Book, Woodward, John. **Nature Activities: Weather Watcher**
Weather Clever Catch Ball

MATERIALS PROVIDED BY TEACHER

Daily weather charts from the newspaper
Paper & pencils
Three-hole punch
Each student should have a three-ring binder with lined paper in which to keep a weather log. In the Supplementary Materials section, there is a handout showing how to organize the weather log. (This log may be used throughout all of the suitcase activities; the weather handouts can be put in the log notebooks.)

For the entire activity and materials and to reserve a Suitcase Exhibit, please call 901.636.2362.

ACTIVITY II: The Water Cycle

DURATION OF ACTIVITY: Approximately 60 minutes each for Parts A, B, and C

LESSON OBJECTIVE: Three experiments will demonstrate the processes of evaporation and condensation, dewpoint and humidity and sublimation and deposition.

GUIDING QUESTIONS

What is the water cycle? What are evaporation, condensation and precipitation? What is the difference between condensation and evaporation? How does temperature affect this process? What is dewpoint (or dew point)? How does humidity affect dewpoint? What are sublimation and deposition? What is the difference between the two?

TENNESSEE STATE STANDARDS

- 6.ESS2.5 Analyze and interpret data from weather conditions, weather maps, satellites, and radar to predict probable local weather patterns and conditions.
- 6.ESS2.6 Explain how relationships between the movement and interactions of air masses, high and low pressure systems, and frontal boundaries result in weather conditions and severe storms.
- 7.PS1.6 Create and interpret models of substances whose atoms represent the states of matter with respect to temperature and pressure.

PART A: Evaporation and Condensation

Lesson Objective: To learn the meaning of evaporation and condensation and the difference between the two.

MATERIALS INCLUDED

Digital scale
1 plastic canister, 1 glass bowl
Rubber gloves
Tongs
Stirring rods or chopsticks or
Water Cycle Kit w/Lesson plans
5 aluminum cans & 5 metal thermometers
Spoon, plastic plates
Rock salt
Dry sponge
Glass Jar
Poster, The Water Cycle: Nature's Recycling System
Poster, The Water Cycle

MATERIALS PROVIDED BY TEACHER

Damp sponge
2 different colors of crayons
Water (to make salt water)
Can of cold soda

Poster, Types of Precipitation
Notebook: Weather: Transparencies, Activities and
Teaching Guide, Milliken Publishing
Book, Weather: Boy Scout Merit Badge Series
Book, Weather, by Rebecca Rupp
Journal pages (copied from The Water Cycle:
Science First), found in Supplementary Materials

PART B: Making Dew: Humidity and Dewpoint

LESSON OBJECTIVES

In this experiment, the students will create dew and measure the dew points of different air samples and discover how humidity affects dew point

MATERIALS INCLUDED

Dry sponge
Teaspoon
2 small plastic jars with lids,
from the water cycle kit
2 thermometers, from the water cycle kit
Sheets of round, colored labels
2 plastic storage boxes
Handout: Student Journal pages

MATERIALS PROVIDED BY TEACHER

Cup of water
Today's weather report
Hot plate for boiling water
Cool water bath
Ice bath

PART C: Making Dew II: Deposition and Sublimation

LESSON OBJECTIVES

In this experiment, students will make frost, discover why frost occurs, and learn the difference between sublimation and deposition

MATERIALS INCLUDED

5 aluminum cans
5 metal thermometers
5 stirring rods (chopsticks)
Rock salt 2 white enamels pans
Gloves or tongs
Student Journal Pages

MATERIALS PROVIDED BY TEACHER

Ice
Dry Ice
Optional: Video of sublimation

For the entire activity and materials and to reserve a Suitcase Exhibit, please call 901.636.2362.

ACTIVITY III: Wind

DURATION OF ACTIVITY:

Making Beaufort scales: 60 minutes, then 15 minutes for 5 days to measure and record wind speed;
60 minute assessment

LESSON OBJECTIVE

Students will each make a Beaufort Wind Scale spinner and record the wind speed for several days. The Wind Scale Spinner activity is from *The Kids' Book of Weather Forecasting*, by Mark Breen, pp. 54-55.

GUIDING QUESTIONS

What is the Beaufort wind scale? How does wind speed affect the forecast?

TENNESSEE STATE STANDARDS

- 6.ESS2.5 Analyze and interpret data from weather conditions, weather maps, satellites, and radar to predict probable local weather patterns and conditions.
- 6.ESS2.6 Explain how relationships between the movement and interactions of air masses, high and low pressure systems, and frontal boundaries result in weather conditions and severe storms.
- 7.ESS3.1 Graphically represent the composition of the atmosphere as a mixture of gases and discuss the potential for atmospheric change.

MATERIALS INCLUDED

Handout, 2 pages, "Make a Beaufort Scale Spinner"
(*The Kids' Book of Weather Forecasting*, pp. 54-55, in
Supplementary Materials)
Wind Wizard Wind Speed Indicator
Paper plates Anemometer
DVD: **Wild Weather: A NOVA Classroom Trip:**
Hurricane! Tornado! and Lightning!
Book, *The Kids' Book of Weather Forecasting*

MATERIALS PROVIDED BY TEACHER

Fine-tipped markers
2 sheets heavyweight paper per student
Rulers for each student
Protractors for each student
Scissors for each student
Brads for each student
Overhead projector
Electric fan, in case there isn't enough wind

For the entire activity and materials and to reserve a Suitcase Exhibit, please call 901.636.2362.

ACTIVITY IV: The Greenhouse Effect in a Jar

DURATION OF ACTIVITY: 30 minutes (2 hours prep)

LESSON OBJECTIVE

From this simple experiment, students for themselves the effects will see of a greenhouse and related this to the temperature increase which occurs when heat is trapped in the atmosphere.

GUIDING QUESTION

What is the Greenhouse Effect?

TENNESSEE STATE STANDARDS

- 6. ESS2.3 Construct an explanation for how atmospheric flow, geographic features, and ocean currents affect the climate of a region through heat transfer.
- 6.ESS2.5 Analyze and interpret data from weather conditions, weather maps, satellites, and radar to predict probable local weather patterns and conditions.
- 6.ESS2.6 Explain how relationships between the movement and interactions of air masses, high and low pressure systems, and frontal boundaries result in weather conditions and severe storms.
- 7.ESS3.1 Graphically represent the composition of the atmosphere as a mixture of gases and discuss the potential for atmospheric change.

MATERIALS INCLUDED

Poster, "The Earth's Atmosphere"
8 Plastic Lab thermometers (2 for each group)
4 plastic canisters (1 for each group)
Stopwatch
Worksheet: The Greenhouse Effect (in Supplementary Materials)

MATERIALS PROVIDED BY TEACHER

Optional: Al Gore's documentary "An Inconvenient Truth"
Pencils, one for each group
Access to a sunny area to perform the experiment

For the entire activity and materials and to reserve a Suitcase Exhibit, please call 901.636.2362.

ACTIVITY V: Tornadoes

DURATION OF ACTIVITY: Video, plus 60 minutes

LESSON OBJECTIVE

Students will watch a video about tornadoes, and create a tornado in a bottle.

GUIDING QUESTIONS

What is a tornado? What causes a tornado?

TENNESSEE STATE STANDARDS

- 6.ESS2.5 Analyze and interpret data from weather conditions, weather maps, satellites, and radar to predict probable local weather patterns and conditions.
- 6.ESS2.6 Explain how relationships between the movement and interactions of air masses, high and low pressure systems, and frontal boundaries result in weather conditions and severe storms.
- 7.ESS3.1 Graphically represent the composition of the atmosphere as a mixture of gases and discuss the potential for atmospheric change.

MATERIALS INCLUDED

NOVA "Wild Weather" videos (3)
Tornado Tube
Food coloring

MATERIALS PROVIDED BY TEACHER

VCR or DVD player
2 plastic bottles the same size (16 oz., 1-liter or 2-liter)
Water
Glitter

For the entire activity and materials and to reserve a Suitcase Exhibit, please call 901.636.2362.

SUITCASE EXHIBIT INVENTORY CHECKLIST

School: _____

Check Out: _____

Return Date: _____

MoSH Check In:	Teacher Check In:	Item	Books/Videos/Posters	Teacher Return:
		A	Teacher's Manual	
		B	Book: Milliken Transparencies	
		C	Book: Eyewitness Books Weather	
		D	Book: The Kid's Book of Clouds	
		E	Book: The Kid's Book of Weather Forecasting	
		F	Book: Feel the Wind	
		G	Book: Down Comes the Rain	
		H	Book: Weather!	
		I	Book: Nature Activities Weather Watcher	
		J	Pamphlet: Weather Boy Scouts of America merit badge series	
		K	Book: Magic Tree House-Twisters	
		L	Poster: The Weather	
		M	Poster: Water Cycle: Nature's Recycling System	
		N	Poster: Cloud Chart	
		O	Poster: Types of Clouds	
		P	Poster: Weather Forecasting maps	
		Q	Poster: Types of Precipitation	
		R	Poster: Earth's Atmosphere	
		S	Poster: Water Cycle	
		T	Poster: Clouds	
		U	Chart: School Days Forecast	
		V	Chart: Today's Weather	
		W	Booklet: Wild Weather (goes with NOVA videos)	
		X	Video: NOVA Tornado	
		Y	Video: NOVA Hurricane	
		Z	Video: NOVA Lightning	

SUITCASE EXHIBIT INVENTORY CHECKLIST

MoSH Check In:	Teacher Check In:	Item	Books/Videos/Posters	Teacher Return:
		1	Demonstration thermometer	
		2	Six-way weather meter	
		3	Clamp (for six- way weather meter)	
		4	2 sets of plastic canisters with lids	
		5	Science model: Cloud (book plus)	
		6	Compact scale	
		7	2 enameled rectangular pans	
		8	10 Metal thermometers (water cycle kit)	
		9	10 clear containers with slotted lids (water cycle kit)	
		10	5 Metal cans (water cycle kit)	
		11	2 plastic spoons (water cycle kit)	
		12	sponge (water cycle kit)	
		13	Hygrometer	
		14	Tongs	
		15	Weather symbols (set of 61)	
		16	5 Sheets of removable stickers	
		17	Inflatable catch ball	
		18	Balloons (bag)	
		19	Marbles	
		20	Bubbles	
		21	Red food coloring	
		22	Rubber gloves	
		23	Bamboo skewers	
		24	Chopsticks- 1 set	
		25	Dry erase markers- set of 4	
		26	Stopwatch	
		27	Glass bowl	
		28	Small ceramic cup	
		29	Barometer	
		30	10 Sling psychrometers	
		31	Compasses	
		32	8 Digital thermometers	
		33	2 Black jar lids	
		34	Container of wire nuts	
		35	10 laboratory thermometers on white plastic	
		36	Tornado tubes	
		37	Anemometer	
		38	Box of rock salt	
		39	5 plastic plates	
		40	32 clothespins	
		41	Talcum powder	
		42	Package of paper plates	
		43	Box of baggies	
		44	Bag of rubber bands	
		45	Wind Wizard wind speed indicator	
		46	Saran Wrap	