

The
ZULA
Patrol

Under the Weather!





Topic: Weather (Temperature)

MISSION: MAKE A STRAW THERMOMETER

MISSION IGNITION!

Teachers: Introduce the Primary Goal by piquing curiosity and stimulating thinking.

Students: Engage in open-ended dialogue related to the MISSION GOALS AND OBJECTIVES.

Gather as many thermometers as you can to bring to the classroom: mercury clinical thermometers, oven thermometers, food thermometers, outside garden thermometers, digital thermometers, decorative "Galileo" thermometers, and more.

- Show students an array of thermometers (and photos of them). Through **open-ended dialogue**, discuss the Primary Goal: What do we call these? What do they do? What does the temperature tell us? (how hot or cold the air is) How are these thermometers different? How are they the same? Have you ever used any of the thermometers that you see? What kind was it? Why did you use it? What did it tell you? How do you think thermometers work?

- The end result of the discussion should be a need on the part of students to explore or solve questions. Encourage children to come up with their own questions.

- Throughout the activity give children *plenty* of time to think and wonder before offering answers. And remember, every answer should be treated as a valuable contribution. Instead of judging an answer as "off topic" or "inaccurate," find out what students are thinking by responding, "How interesting, what makes you say that?"

CREW BRIEFING:

Teachers: View, read about, and discuss this "mission" with your children.

Students: Explore, ask questions, gather information, research (books, video, pictures) and hypothesize.

- **Read** and discuss a book about temperature and weather (See Recommended Reading).

- **Watch** *The Zula Patrol: Under the Weather!* fulldome show. Talk about the theme of weather as it is reflected in changing temperatures.

Q: What do you know about weather?

Q: What different kinds of weather can you name?

Q: What do you know about temperature?

Q: How do scientists and other people measure temperature? (thermometer)

Q: How can you measure temperature without a thermometer? (feeling, by touch)

Q: How does temperature change the weather? (changes form of matter such as water; causes air to move differently, etc.)

- Connect responses to children's MISSION IGNITION observation and discussion.

- Ask students if they would like to find out more about how a thermometer works.

MISSION BLASTOFF!

Teachers: Support and facilitate student experimentation; introduce MISSION VOCABULARY after children describe concepts in their own words.

Students: Experience the concepts, discover, observe, and experiment.

Spread the ingredients needed to create a thermometer out in random order on a table. Invite the class to figure out one scientific tool they could create by using these items. How would they do it? Allow for unusual answers. Encourage them to think about how these things could be used to create a thermometer. Finally, guide students in using the equipment to make a thermometer.

1) Fill the bottle to the brim with water. Add food coloring.

2) Press a hole in the clay and place the straw through it.

3) Place straw in the bottle. Do not let it touch the bottom.

4) Use the clay to keep the straw in place. Tightly seal the bottle's neck.

5) Watch the colored water rise in the straw. Dump out any excess water so that the water fills only half the straw.

6) Your thermometer is now ready for



MISSION GOALS AND OBJECTIVES:

Fundamental Goal: Children will make and experiment with self-made thermometers.

Primary Goal: Children will learn about Patterns of Change by inquiring about and observing the basic function of a thermometer.

Primary Objective: Children will make a thermometer to observe and analyze how it works and responds to changes in temperature.



NATIONAL SCIENCE EDUCATION STANDARDS MET:

- Changes in Earth and sky



MISSION VOCABULARY:

Temperature, Thermometer, Weather, Air



MISSION TIME: This mission can be divided into several shorter periods of discussion, reading, viewing, and experimenting. Be flexible – children's inquiry of temperature and weather can extend and deepen over time.



MISSION EQUIPMENT AND PREPARATION CHECKLIST:

- Plastic water bottle (approx. 11 oz.) filled with room temperature water
- Clear plastic drinking straw
- Food coloring
- Lump of modeling clay
- Tubs (or sink) with hot water and cold water; ice cubes
- Variety of thermometers (actual examples or photos)
- Books about weather and temperature
- Photos and images of weather and temperature related events

Recommended Reading

Find additional titles at zula.com.

Cloudy With a Chance of Meatballs
by Judi Barrett

Weather Words and What They Mean
by Gail Gibbons

I Love the Rain by Margaret Park Bridges

experiments. Ask students to predict what will happen if you put the bottle in a tub of hot water. What about a tub of ice water? Guide students to infer the warmer the temperature, the more the water will rise in the straw –and the cold will make the water go down. This is the basic function of all thermometers. What will happen if you put the thermometer outside today?



MISSION SPIN-OFFS AND CONNECTIONS:

Teachers: *Enrich and extend content by supporting children's understanding of the Primary Goal, its connection to other concepts, and application to "real world" situations.*

Students: *Review results, analyze, record and infer, use deductive reasoning, elaborate on findings, and extend activities to the home.*

• Mission Spin-offs

Weather Report: Students can write and present a daily weather forecast to share with classmates. They may use a variety of thermometers and create a classroom weather station from which to gather data. They also may use the newspaper or computer to gather data for their daily forecasts.

Home Mission: Ask parents to think of all the ways they use thermometers at home and to share these ways with their children. Do they use a meat thermometer to check a roast? Do they check the thermostat to turn on or off the heat? Do they have an outside thermometer?

• Mission Connections

Support additional learning about temperature with *Test Temperatures* and *Get a Grip on the Sun's Temperature* activities.

MISSION ACCOMPLISHED:

Teachers: *Empower students to express their conclusions and determine the next mission.*

Students: *Draw conclusions, assess learning, evaluate what they've discovered, and envision their next mission.*

1) After completing this mission, ask students to assess what they've discovered and how. What conclusions can they draw about temperature and weather? Use their comments to reinforce the Primary Goal. Ask what else the children would like to know about temperature and weather. For additional *Zula Patrol* information and activities, log onto zula.com.

2) **Mission Accomplished Badge:** Celebrate a mission accomplished by downloading this free badge at zula.com. Distribute them for children to color and wear or glue into their science journals.

Congratulations on a mission well done – keep exploring!



FICTION VS. FACT!

Fiction: Many believe that cold temperatures produce fast winds.

Fact: Winds are actually produced by the uneven heating of Earth's surface and the resulting rise and fall of air masses heated differently!



Topic: Wind

MISSION: GAUGE THE WIND

Note that children should NEVER use tools without the proper scientific protection. Note that children should NEVER run with tools (including gauges).



MISSION GOALS AND OBJECTIVES:

Fundamental Goal: Children will make their own wind gauges and play in the wind.

Primary Goal: Children will learn about Energy by inquiring about wind (the movement of air) and its force and direction.

Primary Objective: Children will observe and evaluate the wind with self-made wind gauges.



NATIONAL SCIENCE EDUCATION STANDARDS MET BY THIS MISSION:

- Changes in earth and sky



MISSION VOCABULARY:

Wind, Air, Movement, Breeze, Force, Direction



MISSION TIME: This mission can be divided into several shorter periods of discussion, reading, viewing, constructing, and experimentation. Be flexible – children’s inquiry of wind can extend and deepen over time!



MISSION EQUIPMENT AND PREPARATION CHECKLIST:

- Breezy or windy day
- Lengths of dowels, broomsticks (or unsharpened pencils)
- Strips cut from plastic bags (three per student)
- Masking tape
- Marker or pen
- Colorful tape (optional)
- Saw, goggles, and sandpaper (optional)
- Book about wind
- Wind related photos/images (windmills, kites, weather vanes, sailboats, pinwheel, wind meters and gauges, etc.) available in the online photo library at zula.com.

Recommended Reading

Find additional titles at zula.com.
I Face the Wind by Vicki Cobb
The Wind Blew by Pat Hutchins
Feel the Wind by Arthur Dorros

MISSION IGNITION!

Teachers: *Introduce the Primary Goal by piquing curiosity and stimulating thinking.*

Students: *Engage in open-ended dialogue related to the MISSION GOALS AND OBJECTIVES.*

- Go outside on a breezy or windy morning. What is the weather like today? (sunny, rainy, cloudy, windy) How can you tell that it’s windy? (Sun and/or rain and/or clouds visible) How can you tell it’s windy? Can you see the wind? How do you know that it’s windy if you can’t see wind? (air on face, blowing hair or scarves, swaying trees, fluttering leaves, rippling flag) What other things can tell us if it’s windy? How can you tell which direction that the wind is coming from? How can you measure its strength?

- The end result of the discussion should be a need on the part of the students to explore or solve questions. Encourage children to come up with their own questions.

- Throughout the activity give children *plenty* of time to think and wonder before offering answers. And remember, every answer should be treated as a valuable contribution. Instead of judging an answer as “off topic” or “inaccurate,” say “How interesting, what makes you say that?” to find out what they are thinking!

CREW BRIEFING:

Teachers: *View, read about, and discuss this “mission” with your children.*

Students: *Explore, ask questions, gather information, research (books, video clips, pictures), and hypothesize.*

- **Read** and discuss a book about the wind (see Recommended Reading).

- **Watch** *The Zula Patrol: Under the Weather!* full dome show. Talk about the theme of the wind:

Q: What do you know about wind?

Q: What does wind look like?

Q: If you can’t see wind, how can you tell it’s there? (see things blowing around, hear the wind, feel it)

Q: What does wind feel like?

Q: What is wind made of?

Q: What can wind do?

- Let’s look at pictures of things that use wind to work. (If possible, hold up a picture of a windmill, kite, pinwheel, windsock, etc.) Does anyone know what this is? What does it do? What does the wind make it do?

- Here are some pictures of special tools. What do you think they do? (gauge, or measure the wind)

- Connect children’s responses to their MISSION IGNITION observations and discussion.

- Ask children if they would like to build their own wind gauges!

MISSION BLASTOFF!

Teachers: *Support and facilitate student experimentation; introduce MISSION VOCABULARY after children describe concepts in their own words.*

Students: *Experience the concepts, discover, observe, and experiment.**

Depending on your class and comfort level, you can purchase and cut lengths of dowels yourself, or work with students, a saw, and goggles (for you and the students) to cut lengths of dowel or broomsticks. Other students can use sandpaper to smooth out rough parts of their dowels/sticks. This project also works well with unsharpened pencils.

1) Decorate lengths of wood (dowels, pencils, broomsticks) with colorful tape and/or create and apply name labels with masking tape.

2) Distribute three strips from plastic bags to children (or have students cut the three strips, themselves). Have children stack their strips and fold them over a few times (to reinforce the plastic).

3) Under close supervision, children can carefully thumbtack the strips into the end of the wood (or eraser of the pencil).

4) Go outside and put the gauges to the test. Ask students to observe *other children's* gauges as well as their own. What's happening to them? What information can the students gain from the gauges? Where is the wind coming from? Which way is the wind blowing the streamers? How much are they blowing?

5) Invite children to play with their gauges and have fun with the wind! (But not to run with these tools)



MISSION SPIN-OFFS AND CONNECTIONS:

Teachers: *Enrich and extend content by supporting children's understanding of the Primary Goal, its connection to other concepts, and application to "real world" situations.*

Students: *Review results, analyze, record and infer, use deductive reasoning, elaborate on their findings, and extend activities to the home.*

• Mission Spin-offs

1) Where's the Wind? Mission: Use a compass to mark "North," "South," "East," and "West" on the children's outside play area in chalk or on rocks. Use the wind gauges to determine from which direction the wind is blowing. Use a chart or science journals to track the intensity and direction of the wind over time through pictures and by writing or transcribing the name of the direction from which the wind is blowing.

2) Wind Song Mission: Download the *Breezy* music and lyrics from zula.com. Play the song, teach children the lyrics, and encourage them to sing along!

3) Home Mission: Send home the wind gauge kits (dowel/pencil, plastic bag strips, thumbtack) for families to make together. Children can provide their families with wind reports by monitoring their wind gauges. Families with compasses can determine the compass directions in relation to their wind monitoring location – and place direction markers.

• Mission Connections

Support additional learning about the wind, air, and energy with the *Explore Air* and *Make Sails* activities.

MISSION ACCOMPLISHED:

Teachers: *Empower students to express their conclusions and determine the next mission.*

Students: *Draw conclusions, assess learning, evaluate what they've learned, and envision their next mission.*

1) After completing this mission, ask students to assess what they've discovered and how. What conclusions can they draw about the wind? Use their comments to reinforce the Primary Goal. Ask what else the children would like to know about the wind. For additional *Zula Patrol* activities and information, log onto zula.com.

2) Mission Accomplished Badge: Celebrate a mission accomplished by downloading this free badge at zula.com. Distribute them for children to color and wear or glue into their science journals.

Congratulations on a mission well done – keep exploring!



FICTION VS. FACT!

Fiction: Many people think that all winds are the same.

Fact: In fact, some winds are very mild, like gentle summer breezes, and some are very strong, like hurricanes.



Topics: Clouds (Composition)

MISSION: CREATE A CLOUD IN A JAR

MISSION IGNITION!

Teachers: *Introduce the Primary Goal by piquing curiosity and stimulating thinking.*

Students: *Engage in open-ended dialogue related to the MISSION GOALS AND OBJECTIVES.*

- Go outside and look at the clouds in the sky. Show students pictures of clouds. Through **open-ended dialogue**, discuss the Primary Goal: What do clouds look like to you? (shape, color) What do you think they are made of? How do you think they're made or formed? What do you think they feel like? Would you like to find out?

- The end result of the discussion should be a need on the part of the students to explore or solve questions. Encourage children to come up with their own questions.

- Throughout the activity give children *plenty* of time to think and wonder before offering answers. And remember, every answer should be treated as a valuable contribution. Instead of judging an answer as "off topic" or "inaccurate," say "How interesting, what makes you say that?" to find out what they are thinking!

CREW BRIEFING:

Teachers: *View, read about, and discuss this "mission" with your children.*

Students: *Explore, ask questions, gather information, research (books, video clips, pictures), and hypothesize.*

- **Read** and discuss a book about clouds (see Recommended Reading).

- **Watch** *The Zula Patrol: Under the Weather!* full-dome show. Discuss the subject of clouds, what they're made of, and how they form:

Q: What are the six basic elements that make up weather? (temperature, air pressure, wind, humidity, clouds, precipitation)

Q: What are clouds made of? (water and a tiny bit of dust)

Q: How are clouds formed? (water from Earth's surface rises into the sky and mixes with tiny bits of dust)

Q: What other elements of weather might have an effect on clouds? (temperature, air pressure, wind, humidity)

Connect responses to children's MISSION IGNITION observation and discussion.

- Ask students where clouds usually are. Ask them if they would like to make a cloud right in the classroom!

MISSION BLASTOFF!

Teachers: *Support and facilitate student experimentation; introduce MISSION VOCABULARY after children describe concepts in their own words.*

Students: *Experience the concepts, work with materials, experiment, test, collect data, measure, quantify, discover and observe.*

Safety Note: For the following activity, only adults should manipulate the hot water and matches. Children should watch the "cloud in a jar" from a safe distance. Rules about how hot water and matches/fire can be dangerous should be consistently reinforced with the children.

1) Fill mason jars one third full with hot water from the faucet (should not be boiling).

2) Place a lighted match at the opening of the jar with the water and blow it out. Then quickly place aluminum foil on top. (The match should not touch the water.) *What you are doing is adding dust particles into the jar filled with water drops. Water drops and a tiny bit of dust particles condense to form clouds.*

3) Place ice on top of the foil. *What you are doing is creating cooler air above the warm water and dust particles. This will cause them to rise, and create cloud formations. You will clearly see the clouds form and rise in the jar. You will also see air currents.*

4) Ask children what they see. How are clouds forming in the jar? How do they now think clouds form outside? What color and shape is the cloud? What colors and shapes are the clouds outside?



MISSION GOALS AND OBJECTIVES:

FUNDamental Goal: Children will make a cloud in the classroom.

Primary Goal: Children will learn about Form and Function by inquiring about cloud composition, formation, shapes, and colors.

Primary Objective: Children will learn that clouds are made mostly of water and a tiny bit of dust particles.



NATIONAL SCIENCE EDUCATION STANDARDS MET BY THIS MISSION:

- Earth and sky
- Property, position, and motion of objects



MISSION VOCABULARY:

Cloud, Shape, Color, Dust Particle, Water Drops



MISSION TIME: This mission can be divided into several shorter periods of discussion, reading, viewing, and experimentation. Be flexible – children's inquiry of clouds can extend and deepen over the course of a week or beyond!



MISSION EQUIPMENT AND PREPARATION CHECKLIST:

- Mason jars
- Aluminum foil or pie pan
- Hot, but not boiling, water
- Ice cubes
- Fireplace matches
- Blue food coloring or coffee (optional)
- Book about clouds
- Cloud photographs, which are available in the online photo library at zula.com

Recommended Reading

Find additional titles at zula.com.

Cloud Dance by Thomas Locker
The Cloud Book by Tomie de Paola



MISSION SPIN-OFFS AND CONNECTIONS

Teachers: *Enrich and extend content by supporting children's understanding of the Primary Goal, its connection to other concepts, and application to "real world" situations.*

Students: *Review results, analyze, record and infer, use deductive reasoning, elaborate on findings, and extend activities to the home.*

• Mission Spin-offs

1) Blue Cloud Mission: During the experiment, add blue food coloring to the water (or use coffee) to show that water drops do not change...clouds are always the same (generally whitish/grayish) color.

2) Cloudy Conditions Mission: Now that the main experiment is done, have children predict what will happen if they vary the "cloud-in-a-jar" contents. What will happen if they use cool water instead of warm? What if no dust particles are added? What will happen if there is no ice on top of the foil, etc.? Allow children to experiment with these conditions. (The point you are making is that all original "cloud-in-a-jar" elements are necessary for a cloud to form.)

3) Home Mission: Is there water in the air? Place a sealed, cool canned or bottled drink outside on a warm day. When you return an hour later what has happened? Is it moist or wet on the outside of the can or bottle? Where did the water come from? If the can is dry on the outside, that means there's very little water or humidity in the air. If there is moisture on the outside of the can that means there is water or humidity in the air. The tiny drops of water in the air are attracted to the cool can and condense (change from vapor to liquid) on the surface of the can. (Any moisture on the outside of the can did not come from inside it.) *Note that this last point needs to be stressed. Ask children how water could have come out of the can – if they open a can, do they observe that there is less soda in it? No! So the can must be watertight.*

Mission Connections

Support additional learning about clouds with the *Keep a Cloud Chart* and *Make a Rain Gauge* activities.

MISSION ACCOMPLISHED:

Teachers: *Empower students to express their conclusions and determine the next mission.*

Students: *Draw conclusions, assess learning, evaluate what they've discovered, and envision their next mission.*

1) After completing this mission, ask students to assess what they've discovered and how. What conclusions can they draw about how clouds are formed and what they are made of? Use their comments to reinforce the Primary Goal. Ask what else the children would like to know about clouds. For additional *Zula Patrol* activities and information, log onto zula.com.

2) Mission Accomplished Badge: Celebrate a mission accomplished by downloading this free badge at zula.com. Distribute them for children to color and wear or glue into their science journals.

Congratulations on a mission well done – keep exploring!



FICTION VS. FACT!

Fiction: It is a common misconception that clouds go to oceans to get water.

Fact: Clouds are actually made mostly of water and a tiny bit of dust! They are created when water drops that are in the air condense onto tiny bits of dust that are also in the air.



Topic: Clouds

MISSION: KEEP A CLOUD CHART

MISSION IGNITION!

Teachers: Introduce the Primary Goal by piquing curiosity and stimulating thinking.

Students: Engage in open-ended dialogue related to the MISSION GOALS AND OBJECTIVES.

- Encourage children to observe the sky before they enter the classroom each morning. Look out the classroom window. Through **open-ended dialogue**, discuss the Primary Goal: Are there clouds in the sky? If so, what do the clouds in the sky look like to you? What shape are they? What color are they? (Show children pictures of clouds from books, downloads, etc.) Then ask them which of these cloud pictures do clouds in the sky (today) look most like? (Note: There may be more than one type of cloud in the sky.)

- The end result of the discussion should be a need on the part of the students to explore or solve questions. Encourage children to come up with their own questions.

- Throughout the activity give children *plenty* of time to think and wonder before offering answers. And remember, every answer should be treated as a valuable contribution. Instead of judging an answer as “off topic” or “inaccurate,” say “How interesting, what makes you say that?” to find out what they are thinking!

CREW BRIEFING:

Teachers: View, read about, and discuss this “mission” with your children.

Students: Explore, ask questions, gather information, research (books, video clips, pictures), and hypothesize.

- **Read** and discuss a book about clouds (see Recommended Reading).

- **Watch** *The Zula Patrol: Under the Weather!* full-dome show. Discuss the subject of clouds, what they’re made of, and how they form:

Q: What do you need to create rain, snow, sleet or hail?

Q: What kinds of clouds have you seen in the sky? (cumulus, cumulonimbus, stratus, and cirrus)

Q: What do these different clouds look like? (shape, color)

Q: Which ones look most like the clouds in the sky today?

Connect responses to children’s MISSION IGNITION observation and discussion.

- Ask how the class can keep track of clouds. Ask students what information they want to record. Would they like to make a classroom cloud chart?

MISSION BLASTOFF!

Teachers: Support and facilitate student experimentation; introduce MISSION VOCABULARY after children describe concepts in their own words.

Students: Experience the concepts, determine procedures, use materials, and collect data.

1) Draw students’ attention to the flip chart.

2) Create a chart for measuring/tracking cloud types and descriptions on a daily basis.

3) Ask what types of clouds do children see today? Distribute the *Cloud Cut-Outs* sheet to the children. Ask students which of the cloud pictures the clouds in the sky most closely resemble.

4) Students can compare and discuss their observations and make determinations about the cloud types currently in the sky. Allow each student to cut out each of the four cloud types on the sheet to contribute to the cloud charting materials.

5) Record the cloud types by posting the relevant cloud shapes on the chart along with any other information the students determine they would like to include.

6) Collect cloud data over several days, weeks, or months. Make connections between cloud types and the weather. Incorporate cloud-tracking data into math work.

Note that this activity can be tied to learning the calendar/days of the week.



MISSION GOALS AND OBJECTIVES:

FUNDAMENTAL Goal: Children will make and keep a cloud chart.

Primary Goal: Children will learn about Form and Function by inquiring about cloud shapes and color.

Primary Objective: Children will learn to collect, record, and track cloud observations.



NATIONAL SCIENCE EDUCATION STANDARDS MET BY THIS MISSION:

• Earth and sky • Property, position, and motion of objects



MISSION VOCABULARY: Cloud, Shape, Color, Cumulus, Cirrus, Stratus, Cumulonimbus



MISSION TIME: This mission can be divided into several shorter periods of discussion, reading, viewing, and charting. Be flexible – children’s inquiry of clouds can extend and deepen over the course of a week or beyond!



MISSION EQUIPMENT AND PREPARATION CHECKLIST:

- Day with clouds in the sky
- Copies of *Cloud Cut-Outs* sheet
- Flip chart
- Markers
- Easel
- Book about clouds (flag pictures of the four main cloud types to be discussed)
- Cloud photographs, which are available in the online photo library at zula.com

Recommended Reading

Find additional titles at zula.com.

Cloud Dance by Thomas Locker

The Cloud Book by Tomie de Paola

The Kids’ Book of Clouds & Sky
by Frank Staub

Clouds (Now I Know Series)
by Roy Wandelmaier



MISSION SPIN-OFFS AND CONNECTIONS:

Teachers: *Enrich and extend content by supporting children's understanding of the Primary Goal, its connection to other concepts, and application to "real world" situations.*

Students: *Review results, analyze, record and infer, use deductive reasoning, elaborate on findings, and extend activities to the home.*

• Mission Spin-offs

1) Sign-off Mission: Create a five-columned chart. Label four of the columns with the names of different clouds. In the fifth column place a question mark (for "unsure" or other types of clouds). Every time children observe clouds, invite them to sign their name in the column they think represents the cloud they've seen. This chart can then be reviewed before charting to see how observations vary. (It's *critical* to model respect for opinions and feedback that may differ from the majority of the class.) Students can use pictures to help support their findings and to give fellow students evidence of their determinations.

2) Cloud Song Mission: Download *The Cloud Song* music and lyrics from zula.com (which reinforces the different types of clouds and associated weather). Play the song, teach children the lyrics, and encourage them to sing along!

3) Home Mission: Send an extra copy of the *Cloud Cut-Out* sheet home. Encourage families to make cloud identification part of the morning routine. Using a magnet, children can post the daily cloud shapes on the refrigerator.

• Mission Connections

Support additional learning about clouds with the *Create A Cloud In A Jar* and *Make a Rain Gauge* activities.

MISSION ACCOMPLISHED:

Teachers: *Empower students to express their conclusions and determine the next mission.*

Students: *Draw conclusions, assess learning, evaluate what they've discovered, and envision their next mission.*

1) After completing this mission, ask students to assess what they've discovered and how. What conclusions can they draw about cloud types (and their relation to types of weather)? Use their comments to reinforce the Primary Goal. Ask what else the children would like to know about clouds. For additional *Zula Patrol* activities and information, log onto zula.com.

2) Mission Accomplished Badge: Celebrate a mission accomplished by downloading this free badge at zula.com. Distribute them for children to color and wear or glue into their science journals.

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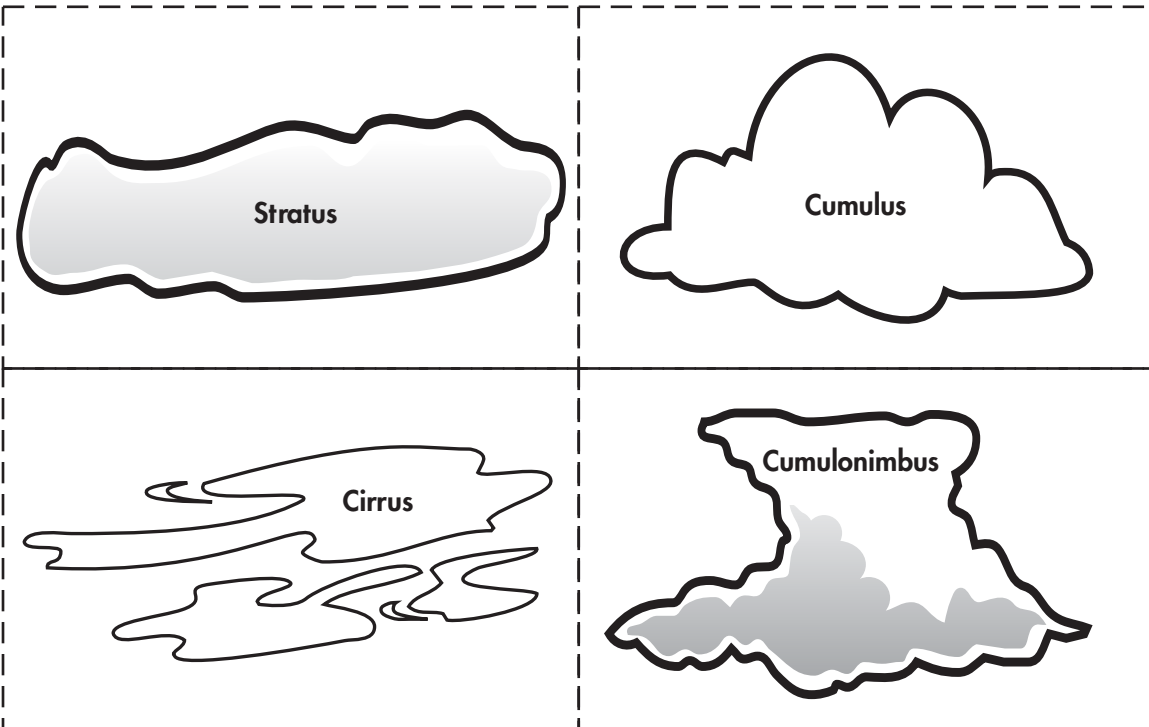


FICTION VS. FACT!

Fiction: It is a common misconception that if it's cloudy, then it will rain.

Fact: Not all clouds are rain clouds. And even rain clouds don't mean that it will definitely rain!

Cloud Cut-Outs





Topic: Clouds (Composition)

MISSION: MAKE A RAIN GAUGE

MISSION IGNITION!

Teachers: Introduce the Primary Goal by piquing curiosity and stimulating thinking.

Students: Engage in open-ended dialogue related to the MISSION GOALS AND OBJECTIVES.

- Go outside and look at the clouds in the sky. Show students pictures of clouds. Through **open-ended dialogue**, discuss the Primary Goal: What do clouds look like to you? (shape, color) What do you think they are made of? How do you think they're made or formed? What do they do? What do we get from clouds? (precipitation: rain, hail, sleet, snow) Do all clouds make precipitation?

Let's make some sound effects!

1) Have children sit down. They should begin rubbing their hands together.

2) After 20–30 seconds, children should start snapping fingers. (It's okay if some stick with hand rubbing.)

3) After 20–30 seconds, children should start snapping clapping hands on thighs. (It's okay if some stick with hand rubbing or snapping fingers.)

4) After 20–30 seconds, children should start stamping their feet. (It's okay if some stick with snapping fingers or clapping hands with thighs.)

5) Slowly reverse this process.

- What did we sound like? Any type of weather?

- The end result of the discussion should be a need on the part of the students to explore or solve questions. Encourage children to come up with their own questions.

- Throughout the activity give children *plenty* of time to think and wonder before offering answers. And remember, every answer should be treated as a valuable contribution. Instead of judging an answer as "off topic" or "inaccurate," say "How interesting, *what* makes you say that?" to find out what they are thinking!

CREW BRIEFING:

Teachers: View, read about, and discuss this "mission" with your children.

Students: Explore, ask questions, gather information, research (books, video clips, pictures), and hypothesize.

- **Read** and discuss a book about clouds (see Recommended Reading).

- **Watch** *The Zula Patrol: Under the Weather!* full-dome show. Discuss the subject of clouds, what they're made of, and how they form:

Q: What do clouds do? (make rain, snow, hail, sleet, which are all types of precipitation)

Q: Do all clouds produce precipitation? (no)

Q: What are some clouds that produce precipitation? (stratus and cumulonimbus)

Q: What are the clouds making today? (rain) If it is not currently raining, ask what children think it might do later. Then read a brief weather forecast for the day.

Connect responses to children's MISSION IGNITION observation and discussion.

- Ask students if they would like to make a tool that will measure how much rain falls. Let children examine rulers. Ask how much rain they think will fall. Make a chart of their estimates.

MISSION BLASTOFF!

Teachers: Support and facilitate student experimentation; introduce MISSION VOCABULARY after children describe concepts in their own words.

Students: Experience the concepts, work with materials, experiment, test, collect data, measure, quantify, discover and observe.

Pre-cut the bottles about 4–5 inches from the top.

1) Give each child one pre-cut bottle. Ask them to place the top of the bottle upside-down inside the bottom of the bottle. Explain that the top of bottle is the funnel and the bottom is the collection container. *Note that if you live in a place where there is little wind, you may not need the funnel. If a lot of wind is expected, then you will want to use it.*



MISSION GOALS AND OBJECTIVES:

FUNDamental Goal: Children will make water gauges.

Primary Goal: Children will learn about Form and Function by inquiring about cloud composition, formation, shape, color, and precipitation.

Primary Objective: Children will use water gauges and measure rainfall.



NATIONAL SCIENCE EDUCATION STANDARDS MET BY THIS MISSION:

- Earth and sky
- Property, position, and motion of objects



MISSION VOCABULARY: Clouds, Shape, Color, Dust Particle, Water Drops, Gauge, Measure, Precipitation



MISSION TIME: This mission can be divided into several shorter periods of discussion, reading, viewing, building tools, and measuring. Be flexible – children's inquiry of clouds and rain can extend and deepen over time!



MISSION EQUIPMENT AND PREPARATION CHECKLIST:

- Rainy day (or forecast for rain and a brief copy of the forecast)
- Raincoats
- Pre-arranged outside location where children can place their water gauges (should be level, away from building, where they will not be disturbed), or send the gauges home for children to measure rainfall with their families.
- Tall, clear plastic bottles with flat bottoms (e.g., a personal-sized water bottle). Post a request for families to collect these ahead of time. Have one per student or one for each small group.
- Sharp scissors
- Rulers
- Pens or permanent markers
- Light-colored plastic tape
- Small digging tools or stones
- Paper or Weather/Science Journal
- Book about clouds
- Cloud and water gauge photographs, which are available in the online photo library at zula.com

2) Hand out a 3-inch length of tape to each child. Invite students to write their name and/or a special symbol on their tape. Help children place their tape along the top edge of the water gauge.

3) Before going outside, ask children where would be a good place to put their water gauges. Ask students what they can do to make sure their gauges don't tip over (dig shallow holes with small tools or surround with stones). Let them choose digging tools or stones to bring outside with them.

4) Go outside. Place the water gauges in open areas away from trees or structures. (Or allow students to choose the locations and use results to inspire questions about why some water gauges have more rain in them than others!)

5) Secure gauges so they won't tip.

6) Later in the day, collect the gauges and measure rainfall with rulers.

7) Compare these results with the children's estimates.



MISSION SPIN-OFFS AND CONNECTIONS:

Teachers: *Enrich and extend content by supporting children's understanding of the Primary Goal, its connection to other concepts, and application to "real world" situations.*

Students: *Review results, analyze, record and infer, use deductive reasoning, elaborate on findings, and extend activities to the home.*

• Mission Spin-offs

1) Rain, Rain, Don't Go Away Mission: Allow children to come up with a long-term plan for measuring water. How long do they want to measure rainfall? How would they like to display their results? Make a beautiful class chart/mural and incorporate other fun facts about rain/precipitation that children can research, record, and illustrate.

2) Hats off to Sleet, Hail, and Snow: Your class can measure more than one type of precipitation! (You will not need funnel tops for snow, so store these for future use.) Ask why the funnels are not used for snow (funnels make it harder for snow to get in to measure.) Compare snow measurement when frozen – to snow measurement when melted. About 12 cm (4.5 inches) of snow equals 1 cm (.33 inches) of water.

3) Home Mission: Daily breakfast-time "weather watches" are a great time for families to read, listen to, or watch weather forecasts together and to track their accuracy.

• Mission Connections:

Support additional learning about clouds with the *Keep a Cloud Chart* and *Create a Cloud in a Jar* activities.

Note to Educators: This activity works well after your class has completed the Create a Cloud in a Jar activity. First, children will discover what clouds are and how they form. Then they will see how rain comes from (some of) them.

MISSION ACCOMPLISHED:

Teachers: *Empower students to express their conclusions and determine the next mission.*

Students: *Draw conclusions, assess learning, evaluate what they've discovered, and envision their next mission.*

1) After completing this mission, ask students to assess what they've discovered and how. What conclusions can they draw about clouds? (what they do, what different kinds there are, etc.) Use their comments to reinforce the Primary Goal. Ask what else the children would like to know about clouds. For additional *Zula Patrol* activities and information, log onto zula.com.

2) Mission Accomplished Badge: Celebrate a mission accomplished by downloading this free badge at zula.com. Distribute them for children to color and wear or glue into their science journals.

Congratulations on a mission well done – keep exploring!

Recommended Reading

Find additional titles at zula.com.

Cloud Dance by Thomas Locker

The Cloud Book by Tomie de Paola

The Kids' Book of Clouds & Sky by Frank Staub

Clouds (Now I Know Series) by Roy Wandelmaier



FICTION VS. FACT!

Fiction: It is a common misconception that clouds go to oceans to get water.

Fact: Clouds are actually made mostly of water and a tiny bit of dust! They are created when water drops that are in the air condense with a tiny bit of dust that's also in the air.

