

Coordinator Notes: Module 3.1 Weather – Weather Forecasting

This Module explores the science behind the weather!

- Students will explore the difference between weather and climate
- Students will learn about the atmosphere, clouds and precipitation (rain!).
- Students will explore key weather features observed by meteorologists, and how they are measured (air pressure, rainfall, wind).
- Experiments will build understanding of cloud formation, air pressure and rainfall.
- Students use their new knowledge to start a weather diary, build and use weather station elements, and predict the weather for the next session!

Session Length:

This Module can be presented in different session durations per your needs.

Lesson plans are provided for:

- A 120 minute session, or, 2 x 60 minute sessions
- 45 minute, 75 minute, and 90 minute sessions

Technology:

PowerPoint: If you do not have access to a data projector and cannot display the PowerPoint presentation, we recommend that you print the most important slides before the session, and either enlarge them onto cardboard to use in place of slides, or create a booklet that students can share in small groups.

The most important slides have been included as a 'Reduced Slides' PowerPoint file, and an easily printable pdf version of these slides is also provided. If you choose this option, we recommend that you still read and use the slide notes included in the full PowerPoint for the session.

The session can be conducted without slides all together, but they offer visual aid in explanation of scientific concepts. We recommend at the very least that instructions for each experiment are printed for the students.

Videos links: The suggested links to online videos within the session can be helpful with explanation. Notes have been included in the slides if there is an essential component to a video which the facilitator should discuss or demonstrate, if the video cannot be played.

Video files: A video file for each Module has been provided to aid explanation and instruction for some experiments and challenges. It is recommended coordinators view video files prior to delivering sessions, if the experiments and challenge activities are unfamiliar.

Please read the Module 3 Risk Assessment before proceeding with the activity

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Module 3.1 Weather – Weather Forecasting: Overview

Begin the session by discussing the weather! Why is it important to know about the weather? What do we know about the weather?

Encourage students to use the scientific method (introduced in Module 1) to form hypotheses for their experiments in Module 3.

Content overview:

Concept / Activity	Session Duration (minutes)			
	120	90	75	45
Why the Weather is Important Introduces the concept weather impacts the day to day lives of individuals, and can impact us at a larger scale (e.g. agriculture)	*	*	*	*
Weather and Climate Introduces the difference between weather and climate.	*	*	*	*
Atmosphere Introduces the layers of the atmosphere; where weather forms.	*	*	*	-
Cloud Formation Introduces evaporation, condensation and cloud formation.	*	*	*	-
Experiment 3.1.2 Cloud in a Bottle Explores cloud formation, air pressure change.	*	*	*	-
Experiment 3.1.3 Cloud in a Jar Explores cloud formation, condensation.	*	*	-	-
Cloud types Introduces the different types and names of clouds.	*	*	*	-
Precipitation Introduces the term for any water falling from clouds.	*	*	*	-
Experiment 3.1.4 Rain Cloud Explores rain falling from clouds.	*	-	-	-
Measuring the Weather Introduces the way weather is observed and measured.	*	*	*	*
Measuring Rainfall Explores rainfall measurement and observation.	*	*	*	-
Measuring Air Pressure Re-visits the concept of air-pressure, explores its measurement.	*	*	*	-
Experiment 3.1.1 Heavy Atmosphere Explores changes in atmospheric pressure using warm air.	*	*	*	-
Measuring Wind Speed & Direction Explores concept of wind speed and direction measurement.	*	*	-	-
Weather Map Explores how to read the key features of synoptic charts.	*	*	*	-
Weather Forecasting Challenge Exploration time for students to build and operate 3 key weather station tools: Barometer, Weather Vane, Rain Gauge.	*	*	*	*

Slides:

PowerPoint Slides are available to support the delivery of this module. Slides explain concepts visually, and include short, engaging videos relevant to the topic. A full list of slides and recommended inclusions for each session duration are provided in the table below. Appropriate slides are also noted in lesson plans for each duration.

PowerPoint Presentation: 'M 3.1 - Master Slides 120 minute Session Duration'		Session Duration (minutes)			
Slide	Content	120	90	75	45
1	Introductory title page for Module 3.1	*	*	*	*
2	Prompt slide: Discussion on why it's important to know about the weather.	*	*	*	*
3	Prompt slide: outlines difference between weather and climate	*	*	*	*
4	Prompt slide: introduces atmospheric layers	*	*	*	-
5	Prompt slide: outlines cloud formation	*	*	*	-
6	Experiment E3.1.2 Outline: Cloud in a Bottle	*	*	*	-
7	Experiment E3.1.3 Outline: Cloud in a Jar	*	*	-	-
8	Prompt slide: outlines names and types of clouds	*	*	*	-
9	Prompt slide: introduces precipitation	*	*	*	-
10	Experiment E3.1.4 Outline: Rain Cloud	*	-	-	-
11	Prompt slide: outlines how weather is measured	*	*	*	*
12	Prompt slide: discusses rainfall measurement	*	*	-	-
13	Prompt slide: discusses air pressure & it's measurement	*	*	*	*
14	Experiment E3.1.1 Outline: Heavy Atmosphere	*	*	*	-
15	Prompt slide: discusses wind speed, wind direction & measurement	*	*	-	-
16	Prompt slide: outlines key features on weather maps	*	*	*	-
17	Introductory slide for C3.1 Weather Forecasting Challenge	*	*	*	*
18	Overview of Weather Station elements for Challenge	*	*	*	*
19	Outlines building a barometer	*	*	*	*
20	Outlines building a weather vane	*	*	*	*
21	Outlines building a rain gauge	*	*	*	*
22	Session references, online links	*	*	*	*

<p align="center">Module 3.1 Water – Weather Forecasting</p> <p align="center">Lesson Plan</p> <p align="center">120 minute session or 2 x 60 minute sessions</p>			
<p>High Tech: Use PowerPoint Presentation ‘M3.1 - Master Slides 120 minute Session Duration’</p> <p>Low Tech: Print PowerPoint ‘M3.1 - Reduced Slides for Printing’. Use slide notes from the ENTIRE 120 minute presentation, adapting discussion to cover omitted slides.</p>			
<p>Key Learning Area Earth Science, Physical World</p>			<p>Topic Weather Forecasting</p>
Timing	Running Time (hh:mm)	Procedure	Materials
5 min	00:05	<p>Lesson Introduction</p> <p>Welcome. Brainstorm: Why is the weather important?</p>	PowerPoint M3.1 (slides 1-2)
2 min	00:07	<p>Body of Lesson (Lesson 1, 2 x 60 minute sessions)</p> <p>Weather and climate – what’s the difference?</p>	PowerPoint M3.1 (slide 3)
3 min	00:10	The Atmosphere and its layers – where weather happens!	PowerPoint M3.1 (slide 4)
2 min	00:12	Cloud formation, evaporation, condensation. The water cycle!	PowerPoint M3.1 (slide 5)
3 min	00:15	Discuss hypothesis, demonstrate Experiment E3.1.2 ‘Cloud in a Bottle’	PowerPoint M3.1 (slide 6), plastic soft-drink bottle, liquid rubbing alcohol, balloon / rubber, duct tape, air pump
10 min	00:25	Discuss hypothesis, conduct Experiment E3.1.3 ‘Cloud in a Jar’	PowerPoint M3.1 (slide 7), glass jars with lids, hot water, food colouring (optional), ice cubes, aerosol hairspray

5 min	00:30	Introduce and discuss the different types of clouds, and how they help forecast weather. Watch 'What's that cloud' video. (If video unable to be played, coordinator should watch prior to the session).	PowerPoint M3.1 (slide 8)
3 min	00:33	Precipitation: it's what we call rain, hail and snow! Discuss how we know when rain is coming, watch video.	PowerPoint M3.1 (slide 9)
7 min	00:40	Discuss hypothesis, conduct Experiment E3.1.4 'Rain Cloud'	PowerPoint M3.1 (slide 10), clear jars / cups, water, food colouring, shaving cream, pipettes / straws
3 min	00:43	How do we measure the weather? Watch forecasting video. (If video unable to be played, coordinator should watch prior to the session).	PowerPoint M3.1 (slide 11)
2 min	00:45	Measuring rainfall – rain gauges and radars.	PowerPoint M3.1 (slide 12)
3 min	00:48	Recap what we know about air pressure. Discuss how we measure air pressure, using a barometer.	PowerPoint M3.1 (slide 13)
7 min	00:55	Discuss hypothesis, conduct Experiment E3.1.1 'Heavy Atmosphere'	PowerPoint M3.1 (slide 14), glass jars, balloons, straws, tea-light candles, matches
2 min	00:57	Measuring wind speed & direction	PowerPoint M3.1 (slide 15)
		(Break for 2 x 60 minute sessions)	
		(Lesson 2, 2 x 60 minute sessions)	
2 min	00:02 / 01:02	Putting it all together – reading a weather map!	PowerPoint M3.1 (slide 16)
3 min	00:05 / 01:05	Introduce challenge activity. Recap 3 key weather measurement devices: Barometer, Rain Gauge, Weather Vane	PowerPoint M3.1 (slides 17-18)

2 min	00:08 / 01:08	Form into groups, hand out planning sheets.	M3.1 Planning sheets
2 min	00:10 / 01:10	Short intro on building a balloon barometer. Recap on air pressure.	PowerPoint M3.1 (slide 19)
10 min	00:20 / 01:00	Construct barometers.	Glass jars /cups, balloons, rubber bands, cardboard, glue, straws, toothpicks, pens
2 min	00:22 / 01:22	Hand out weather diaries. Take initial air pressure readings and record in weather diaries.	M3.1 Weather diary
2 min	00:24 / 01:24	Short intro on building a weather vane.	PowerPoint M3.1 (slide 20)
10 min	00:34 / 01:34	Construct weather vanes. Test in light wind (if windy) and / or test indoors with aid of a pedestal fan.	thumbtacks / drawing pins, pencils with erasers, masking tape, compass, cardboard, modelling clay, markers, fan
2 min	00:36 / 01:36	Short intro on building a rain gauge.	PowerPoint M3.1 (slide 21)
10 min	00:46 / 01:46	Construct rain gauges. Test outside with watering can if space permits.	Plastic bottles, rulers, rocks / gravel, scissors, watering can.
2 min	00:48 / 01:48	Take second air pressure reading and record in weather diaries. Discuss readings – has air pressure changed?	M3.1 Weather Diary, Barometers
7 min	00:55/ 01:55 END	Lesson Conclusion Clean up. Compare constructed designs for barometers, rain gauges and weather vanes. Decide which students will take home which devices, to record weather observations leading up to the next session. Discuss where to position each device (e.g. outdoors, under cover or in the open). Discuss the weather diary and how to fill it out.	M3.1 Weather diary

Module 3.1 Weather – Weather Forecasting: Experiments

E3.1.1: Heavy Atmosphere

Aim: To observe the effect of atmospheric pressure.

Materials (per group):

- Glass jar
- 1-2 balloons
- Tea light candle
- Water
- Straw
- BBQ lighter (long handle) or long matches

Procedure:

1. Divide into groups and collect materials.
2. Partially fill a balloon with water, until it is a fraction too big to fit through the opening of the jar. Tie the balloon closed.
3. Place the water filled balloon onto the jar and observe, then remove.
4. Place the tea light candle into the bottom of the glass jar, and carefully light it.
5. Place the water-filled balloon onto top of the glass jar (with the lit candle inside).
6. Observe.

Extension: Remove the balloon from the bottle, without popping it. (Hint: Use the straw)

Expected Result:

The water-filled balloon will sit on top of the jar, as it is slightly too big to fit through the opening. Once the candle is lit inside the jar, the water filled balloon will shake slightly for a few seconds, then it will fall into the jar. The balloon won't come out of the jar if you just pull on it. However, when a straw is put inside the jar, pulling on the balloon will cause it to come out of the jar.

Explanation:

The atmospheric pressure inside the jar and outside the jar are equal, before the candle is lit. Atmospheric pressure is pushing down on the balloon when it sits on the jar, and air inside the jar is pushing back upwards so the balloon cannot enter the jar.

When the candle flame heats the air in the bottle, the hot air rises and some air leaves the jar. This lowers the air pressure inside the jar, compared to the air outside the jar. Air always wants to move from an area of high pressure to an area of low pressure. So here, the higher pressure air outside the jar wants to move into the low pressure area in the jar, and the air pushes the balloon down into the jar as it goes.

If you put the straw into the bottle, this helps to again create lower air pressure below the balloon, and air can flow in from higher air pressure areas outside the jar, and fill the space below the balloon as it is pulled upwards.

*****This experiment is demonstrated in the Module 3 video*****

E3.1.2: Cloud in a Bottle (Facilitator Demonstration)

Aim: To observe air pressure change and cloud formation.

Materials (demonstration):

- Plastic soft-drink bottle
- Liquid rubbing alcohol
- Strong balloon / rubber
- Duct tape
- Air pump (balloon bump, foot pump or bike pump)

Method:

1. Add a splash of rubbing alcohol to your plastic bottle and swirl it around to coat all the sides.
 2. Tightly cover the top of your bottle using the balloon and duct tape.
 3. Pierce a hole in the bottle cover, the same size of your pump nozzle.
 4. Ensure the pump nozzle and hole in the balloon are as air tight as possible.
 5. Pump air into the bottle till it becomes hard to pump.
 6. Remove the pump nozzle as quickly as you can.
 7. Observe.
- Repeat step 5, observe again.

Expected Result:

The clear air in the bottle suddenly turns cloudy as the pump nozzle is removed, after pumping the bottle full of air. When more air is pumped into the bottle the cloudiness turns clear again. This can happen over and over again when you pump and release the pressure.

Explanation:

Clouds are formed when water vapour in the atmosphere condenses. In the bottle, the air naturally contains some water vapour. Also inside the bottle is some evaporated alcohol vapour, which acts like the dust particles we find in the atmosphere.

When air is pumped into the bottle, the air pressure inside the bottle increases. The increases air pressure also increases the air temperature inside the bottle. When we abruptly release the pressure by removing the pump nozzle, we get a sudden decrease in pressure, as the air quickly moves from the area of high to lower pressure. With this pressure drop we also get a temperature drop, just like we have as we get further up into the atmosphere. This temperature drop causes the water vapour to condense onto the alcohol particles (acting like atmospheric dust) and forms the cloud.

If we pump more air into the bottle, and bring the pressure back up, the cloud disappears as the liquid water turns back into vapour with the increased temperature.

*****This experiment is demonstrated in the Module 3 video*****

E3.1.3: Cloud in a Jar

Aim: To observe water condensation and cloud formation.

Materials (per group):

- Glass jar with lid
- 150ml hot water (do not boil)
- Food colouring (optional)
- 3 to 5 cubes of ice
- Aerosol Hairspray (shared between groups)

Method:

1. Add food colouring to the hot water (optional) and pour into the jar. Fill to just under half-way.
2. Place the lid tightly onto the jar and swirl the hot water inside.
3. Quickly: Remove the lid, spray 1 squirt of hairspray into the jar, and replace the lid.
4. Place the jar onto the table and place the ice-cubes on top of the closed lid.
5. Observe.
6. Remove the ice-cubes, and the lid. Observe.

Expected Result:

Water vapour will become visible inside the jar, as condensation on the sides of the jar. After the hair-spray is added, water vapour will be more visible inside the jar, appearing as a cloud, as the water vapour condenses onto the aerosol particles. When the lid is opened at step 6, the cloud will rise out of the jar in a swirling pattern.

Explanation:

Clouds form when water vapour rises into the atmosphere and then condenses onto microscopic droplets onto dust particles in the air, as air pressure lowers and air temperature cools.

In this experiment, the warm water heats the air inside the jar, and some of the warm water evaporates and becomes water vapour. The warm air and water vapour rise towards the lid.

The ice-cubes on the jar lid keep the surrounding air cool. When the warm air inside the jar meets the cool air near the lid, it cools down, and the water vapour condenses into droplets. The room temperature air outside the jar is also cooler than inside the jar. This causes the water vapour to condense into droplets onto the glass sides of the jar.

The hairspray inside the jar acts like dust particles in the atmosphere. The water vapour in condenses onto the particles of hairspray and forms a cloud in the jar. If you observe the cloud carefully, you'll noticed that it swirls around inside the jar. This swirling is caused by the circulating air (i.e. warm air rising and cold air sinking). The warm air will rise out of the jar when the lid is removed, as warm air naturally rises up.

E3.1.4: Rain Cloud

Aim: To simulate rain falling from clouds.

Materials (per group):

- 2 clear cups or jars
- 250ml water
- Food colouring
- Pipette or straw
- Handful of shaving cream

Procedure:

1. Pour water into cup 1, filling to approx. 3/4 full.
2. Pour remaining water into cup 2, add a few drops of food colouring. Stir.
3. Place a cloud of shaving cream onto the surface of the clear water in cup 1.
4. Using the pipette (or straw), add droplets of the coloured water to the top of the cloud.
5. Observe.

Expected Result:

The coloured water will begin to appear as streams of colour through the shaving cream, into the water below.

Explanation:

The coloured water droplets are denser than the shaving cream, and sink through the shaving cream into the water below.

Note:

- ***Be aware of potential sensitivities to shaving cream. The shaving cream could be replaced with a piece of kitchen sponge.***

Challenge M3.1 – Weather Forecasting Challenge

Coordinator Notes

Scoring:

A scoring mechanism is not included for this module. Consider asking students how they might approach the task differently if asked to do it again, or how they might teach the same things they learned during the club to a younger student.

Activity Notes:

- Students may choose to work individually, or in groups of 3.
- Students will take home their three devices (if working individually) or one of the devices made by their group.
- Students should be encouraged to fill in a weather diary for the period leading up to the next session.
- If time allows, head outside at the end of the session and try to identify any weather indicators for the day. Add these to the weather diary for the day.
- Coordinators go through the 'Weather Diary' sheet with students and explain how to note observations.
- Encourage students to make barometers first, and to take an air-pressure reading at the start and end of the session.
- Planning sheets are provided for each device. These show suggested materials and designs.
- There are no wrong designs. Support students to be creative, and if devices don't work, explore how they would improve them if they approached the activity again.
- A Weather Diary has been provided. Students may like to make their own. Again, there are no wrong designs.

Challenge M3.1 – Weather Diary

Weather Observer:					Location:		
Day of the Week	Date	Time	Temperature (Hot, Average, Cold)	Cloud Types Visible	Rainfall (mm)	Wind Direction (N, E, S, W)	Air Pressure (High, Medium or Low)

Challenge M3.1 – Planning Sheet: Barometer

To design your barometer, keep in mind:

Balloon – The surface of the balloon across the jar needs to be stretched as tightly and as flatly / smoothly as possible. You'll need to cut the small neck off from the balloon to fit it over the jar.

Straw – The straw needs to be attached to the balloon surface, but still allow the balloon to contract and expand (sink and bulge). Tape it to the middle of the balloon.

Pointer – Will you cut your straw into a point? Will you add a toothpick to your straw? Will your straw be short, or long?

Measurement scale – Will you mark your cardboard like a ruler, to see small differences, or just show Medium, High and Low? Will your cardboard be attached to your jar, or stand next to it?

Take a look at the materials available, and design your barometer!



<http://www.housingaforest.com/how-to-make-a-barometer/>



<http://spoonful.com/crafts/balloon-barometer>

Challenge M3.1 – Planning Sheet: Weather Vane

To design your weather vane keep in mind:

Base – How will your weather vane stand up? Will it have its own base, or need to be fastened to something?

Balance – the middle of your arrow stem might not be the balance point. Balance your stem on your finger to find where to place the pin.

Movement – The weather vane needs to be able to spin. You may need to make a small hole in the pencil eraser slightly larger than the pin.

Direction – You'll need know which was is North, East, South and West when you position your weather vane. Remember... the sun rises in the East and sets in the West!

Take a look at the materials available, and design your weather vane!



<http://preservinghomebasics.com/2011/11/weather-crafts-for-children>

Challenge M3.1 – Planning Sheet: Rain Gauge

To design your rain gauge keep in mind:

Base – If the base of your bottle isn't flat, you may need to add water to fill the bottle to a starting level. You may choose to also add gravel, or sand. Each time you take a measurement, you'll need to refill / reset the base level.

Top – Rain needs to get into the gauge. Will you funnel on the top?

Emptying – You'll need to empty your rain gauge after each measurement. Make sure water can be emptied out.

Measurement scale – Will you mark your rain gauge like a ruler? How close will your scale lines be, will you use 1 millimetre spaces, or 5 millimetre steps?

Positioning – where will your rain gauge be placed when it is ready for measuring? Will it need to be fastened to something so it doesn't fall over?

Take a look at the materials available, and design your rain gauge!



<http://www.wikihow.com/Build-a-Rain-Gauge/>

Module 3.1 Weather – Weather Forecasting Lesson Plan

90 minute session

High Tech: Adapt PowerPoint Presentation 'M3.1 - Master Slides', hide slide 10.
Low Tech: Print PowerPoint 'M3.1 - Reduced Slides for Printing'. Use slide notes for the ENTIRE 90 minute presentation, adapting discussion to cover omitted slides.

Key Learning Area
Earth Science, Physical World

Topic
Weather Forecasting

Timing	Running Time (hh:mm)	Procedure	Materials
2 min	00:02	Lesson Introduction Welcome. Brainstorm: Why is the weather important?	PowerPoint M3.1 (slides 1-2)
2 min	00:04	Body of Lesson Weather and climate – what's the difference?	PowerPoint M3.1 (slide 3)
2 min	00:06	The Atmosphere and its layers – where weather happens!	PowerPoint M3.1 (slide 4)
2 min	00:08	Cloud formation, evaporation, condensation. The water cycle!	PowerPoint M3.1 (slide 5)
3 min	00:11	Discuss hypothesis, demonstrate Experiment E3.1.2 'Cloud in a Bottle'	PowerPoint M3.1 (slide 6), plastic soft-drink bottle, liquid rubbing alcohol, balloon / rubber, duct tape, air pump
9 min	00:20	Discuss hypothesis, conduct Experiment E3.1.3 'Cloud in a Jar'	PowerPoint M3.1 (slide 7), glass jars with lids, hot water, food colouring (optional), ice cubes, aerosol hairspray
4 min	00:24	Introduce and discuss the different types of clouds, and how they help forecast weather. Watch 'What's that cloud' video. (If video unable to be played, coordinator should watch prior to the session).	PowerPoint M3.1 (slide 8)

2 min	00:26	Precipitation: it's what we call rain, hail and snow! Discuss how we know when rain is coming. (Omit video).	PowerPoint M3.1 (slide 9)
3 min	00:29	How do we measure the weather? Watch forecasting video. (If video unable to be played, coordinator should watch prior to the session).	PowerPoint M3.1 (slide 11)
2 min	00:31	Measuring rainfall – rain gauges and radars.	PowerPoint M3.1 (slide 12)
3 min	00:34	Recap what we know about air pressure. Discuss how we measure air pressure, using a barometer.	PowerPoint M3.1 (slide 13)
7 min	00:41	Discuss hypothesis, conduct Experiment E3.1.1 'Heavy Atmosphere'	PowerPoint M3.1 (slide 14), glass jars, balloons, straws, tea-light candles, matches
2 min	00:43	Measuring wind speed & direction	PowerPoint M3.1 (slide 15)
2 min	00:45	Putting it all together – reading a weather map!	PowerPoint M3.1 (slide 16)
2 min	00:47	Introduce challenge activity. Recap 3 key weather measurement devices: Barometer, Rain Gauge, Weather Vane	PowerPoint M3.1 (slides 17-18)
2 min	00:49	Form into groups, hand out planning sheets.	M3.1 Planning sheets
2 min	00:51	Short intro on building a balloon barometer. Recap on air pressure.	PowerPoint M3.1 (slide 19)
9 min	01:00	Construct barometers. Hand out weather diaries. Take initial air pressure readings and record in weather diaries.	Glass jars /cups, balloons, rubber bands, cardboard, glue, straws, toothpicks, pens M3.1 Weather diary
2 min	01:02	Short intro on building a weather vane.	PowerPoint M3.1 (slide 20)

9 min	1:11	Construct weather vanes. Test in light wind (if windy) and / or test indoors with aid of a pedestal fan.	Thumbtacks / drawing pins, pencils with erasers, masking tape, compass, cardboard, modelling clay, markers, fan
2 min	1:13	Short intro on building a rain gauge.	PowerPoint M3.1 (slide 21)
9 min	1:21	Construct rain gauges. Test outside with watering can if space permits.	Plastic bottles, rulers, rocks / gravel, scissors, watering can.
2 min	1:23	Take second air pressure reading and record in weather diaries. Discuss readings – has air pressure changed?	M3.1 Weather Diary, Barometers
7 min	01:30 END	<p>Lesson Conclusion</p> <p>Clean up. Compare constructed designs for barometers, rain gauges and weather vanes. Decide which students will take home which devices, to record weather observations leading up to the next session. Discuss where to position each device (e.g. outdoors, under cover or in the open). Discuss the weather diary and how to fill it out.</p>	M3.1 Weather diary

Module 3.1 Weather – Weather Forecasting Lesson Plan

75 minute session

High Tech: Adapt PowerPoint Presentation 'M3.1 - Master Slides', hide slides: 7, 10, 12, and 15.

Low Tech: Print PowerPoint 'M3.1 - Reduced Slides for Printing'. Use slide notes for the ENTIRE 75 minute presentation, adapting discussion to cover omitted slides.

Key Learning Area

Earth Science, Physical World

Topic

Weather Forecasting

Timing	Running Time (hh:mm)	Procedure	Materials
3 min	00:03	<p>Lesson Introduction</p> <p>Welcome. Brainstorm: Why is the weather important?</p>	PowerPoint M3.1 (slides 1-2)
2 min	00:05	<p>Body of Lesson</p> <p>Weather and climate – what's the difference?</p>	PowerPoint M3.1 (slide 3)
3 min	00:08	<p>The Atmosphere and its layers – where weather happens!</p>	PowerPoint M3.1 (slide 4)
2 min	00:10	<p>Cloud formation, evaporation, condensation. The water cycle!</p>	PowerPoint M3.1 (slide 5)
3 min	00:13	<p>Discuss hypothesis, demonstrate Experiment E3.1.2 'Cloud in a Bottle'</p>	PowerPoint M3.1 (slide 6), plastic soft-drink bottle, liquid rubbing alcohol, balloon / rubber, duct tape, air pump
5 min	00:18	<p>Introduce and discuss the different types of clouds, and how they help forecast weather. Watch 'What's that cloud' video. (If video unable to be played, coordinator should watch prior to the session).</p>	PowerPoint M3.1 (slide 8)

2 min	00:20	Precipitation: it's what we call rain, hail and snow! Discuss how we know when rain is coming. (Omit video).	PowerPoint M3.1 (slide 9)
3 min	00:23	How do we measure the weather? Watch forecasting video. (If video unable to be played, coordinator should watch prior to the session).	PowerPoint M3.1 (slide 11)
3 min	00:26	Recap what we know about air pressure. Discuss how we measure air pressure, using a barometer.	PowerPoint M3.1 (slide 13)
7 min	00:33	Discuss hypothesis, conduct Experiment E3.1.1 'Heavy Atmosphere'	PowerPoint M3.1 (slide 14), glass jars, balloons, straws, tea-light candles, matches
2 min	00:35	Putting it all together – reading a weather map!	PowerPoint M3.1 (slide 16)
3 min	00:38	Introduce challenge activity. Recap 3 key weather measurement devices: Barometer, Rain Gauge, Weather Vane	PowerPoint M3.1 (slides 17-18)
2 min	00:40	Form into groups, hand out planning sheets.	M3.1 Planning sheets
2 min	00:42	Short intro on building a balloon barometer.	PowerPoint M3.1 (slide 19)
8 min	00:50	Construct barometers. Hand out weather diaries. Take initial air pressure readings and record in weather diaries.	Glass jars /cups, balloons, rubber bands, cardboard, glue, straws, toothpicks, pens M3.1 Weather diary
2 min	00:52	Short intro on building a weather vane.	PowerPoint M3.1 (slide 20)
8 min	1:00	Construct weather vanes. Test in light wind (if windy) and / or test indoors with aid of a pedestal fan.	thumbtacks / drawing pins, pencils with erasers, masking tape, compass, cardboard, modelling clay, markers, fan

2 min	1:02	Short intro on building a rain gauge.	PowerPoint M3.1 (slide 21)
8 min	1:10	Construct rain gauges. Test outside with watering can if space permits.	Plastic bottles, rulers, rocks / gravel, scissors, watering can.
2 min	1:12	Take second air pressure reading and record in weather diaries. Discuss readings – has air pressure changed?	M3.1 Weather Diary, Barometers
3 min	01:15 END	<p>Lesson Conclusion</p> <p>Clean up. Compare constructed designs for barometers, rain gauges and weather vanes. Decide which students will take home which devices, to record weather observations leading up to the next session. Discuss where to position each device (e.g. outdoors, under cover or in the open). Discuss the weather diary and how to fill it out.</p>	M3.1 Weather diary

Module 3.1 Weather – Weather Forecasting Lesson Plan

45 minute session

High Tech: Adapt PowerPoint Presentation 'M3.1 - Master Slides', hide slides: 4, 5, 6, 7, 8, 9, 10, 12, 14, and 15.

Low Tech: Print PowerPoint 'M3.1 - Reduced Slides for Printing'. Use slide notes for the ENTIRE 45 minute presentation, adapting discussion to cover omitted slides.

Key Learning Area
Earth Science, Physical World

Topic
Weather Forecasting

Timing	Running Time (hh:mm)	Procedure	Materials
3 min	00:03	Lesson Introduction Welcome. Brainstorm: Why is the weather important?	PowerPoint M3.1 (slides 1-2)
2 min	00:05	Body of Lesson Weather and climate – what's the difference?	PowerPoint M3.1 (slide 3)
3 min	00:08	How do we measure the weather? Watch forecasting video. (If video unable to be played, coordinator should watch prior to the session).	PowerPoint M3.1 (slide 11)
3 min	00:11	Introduce challenge activity. Explain 3 key weather measurement devices: Barometer, Rain Gauge, Weather Vane	PowerPoint M3.1 (slides 17-18)
2 min	00:13	Form into groups, hand out planning sheets.	M3.1 Planning sheets
9 min	00:22	Recap air pressure concept. Short intro on building a balloon barometer. Construct barometers.	PowerPoint M3.1 (slide 13, 19) Glass jars /cups, balloons, rubber bands, cardboard, glue, straws, toothpicks, pens

9 min	00:31	Short intro on building a weather vane. Construct weather vanes. Test in light wind (if windy) and / or test indoors with aid of a pedestal fan.	PowerPoint M3.1 (slide 20) thumbtacks / drawing pins, pencils with erasers, masking tape, compass, cardboard, modelling clay, markers, fan
9 min	00:40	Short intro on building a rain gauge. Construct rain gauges. Test outside with watering can if space permits.	PowerPoint M3.1 (slide 21) Plastic bottles, rulers, rocks / gravel, scissors, watering can.
5 min	00:45 END	<p>Lesson Conclusion</p> <p>Clean up. Compare constructed designs for barometers, rain gauges and weather vanes. Decide which students will take home which devices, to record weather observations leading up to the next session. Discuss where to position each device (e.g. outdoors, under cover or in the open). Discuss the weather diary and how to fill it out. Show students how to take readings using each device.</p>	M3.1 Weather diary

M3.1 References

Climate and Weather

https://www.nasa.gov/mission_pages/noaa-n/climate/climate_weather.html

Clouds

<http://www.bom.gov.au/weather-services/about/cloud/cloud-types.shtml>

<http://media.bom.gov.au/social/blog/895/whats-that-cloud/>

<https://www.metoffice.gov.uk/learning/clouds/what-are-clouds>

Atmosphere

https://www.nasa.gov/mission_pages/sunearth/science/atmosphere-layers2.html

Air Pressure

<http://www.abc.net.au/science/articles/2013/01/31/3679358.htm>

<https://www.livescience.com/40664-balloon-barometer-science-fair-project.html>

Weather Measurement

<http://splash.abc.net.au/home#!/media/85668/weather-forecasting>

<http://www.metoffice.gov.uk/learning/weather-for-kids/weather-station/rain-gauge>

<http://splash.abc.net.au/home#!/media/528041/day-in-the-life-of-a-meteorologist>

<http://splash.abc.net.au/home#!/media/527997/a-day-at-the-geraldton-weather-station>

<http://splash.abc.net.au/home#!/media/30213/making-a-rain-gauge>

Module 3.1 - Required Materials

- Pens, pencils and writing paper are generally required every session.
- Students may like to bring a note pad to record their observations and ideas.
- A group usually refers to 2 - 4 students.

Activity	Material	Amount	Where can I find it?
All sessions	PowerPoint Slides* (digital, or printed)	1 per coordinator	Coordinator Package
All sessions	Printed PowerPoint* Slide Notes	1 per coordinator	Coordinator Package
All sessions	Printed Lesson Plan	1 per coordinator	Coordinator Package
All sessions	Printed Module 1 Risk Assessment	1	Coordinator Package
All sessions	Computer, Data Projector, Screen	1	Venue
Experiment E3.1.2 Cloud in a Bottle 120 minute, 2 x 60 minute, 90 minute, and 75 minute sessions	Plastic / PET soft-drink bottle	2 x 1.25L (1 spare)	Supermarket /recycled
	Liquid Rubbing Alcohol	1 bottle	Supermarket / pharmacy
	Strong balloon / rubber	2 pieces (1 spare)	Supermarket/recycled
	Duct tape	1 roll	Supermarket / hardware store
	Air pump (foot pump, balloon pump, bike pump)	1	Supermarket / recycled, hardware / sports store
Experiment E3.1.3 Cloud in a Jar 120 minute, 2 x 60 minute, and 90 minute sessions	Glass jars with lids	1 per group	Supermarket / recycled
	hot water	150ml per group	From venue tap or kettle (do not boil)
	Ice cubes	3 – 5 per group	Bag of ice from service station, supermarket
	Aerosol hairspray	2 cans shared between groups	Supermarket, pharmacy
	Optional food colouring	1 -2 drops per group	supermarket

Required materials list continues on next page

* PowerPoint Slides have been provided as a Master Slide Set for a 120 minute (or 2 x 60 minute) session duration. Hide/ omit slides as noted in lesson plans for delivery of shorter session durations.

Note: Some listed materials, for example jars, straws, and food colouring can be re-used for multiple experiments. Review the experiments you plan to include, and the required materials for efficiencies, prior to sourcing materials for your session.

Activity	Material	Amount	Where can I find it?
Experiment E3.1.4 Rain Cloud 120 minute, 2 x 60 minute sessions	Clear cups or jars	1 per group	Supermarket / recycled
	water	250ml per group	Venue or supermarket
	Pipettes or straws	1-3 per group	Supermarket/pharmacy
	Shaving Cream	2 cans shared between groups	Supermarket, pharmacy
	Food colouring	1 -2 drops / group	Supermarket
Experiment E3.1.1 Heavy Atmosphere 120 minute, 2 x 60 minute and 90 minute sessions	Glass jars	1 per group	Supermarket / recycled
	Balloons	1 – 2 per group	Supermarket
	Tea light candle	1 – 2 per group	Supermarket
	Straws (drinking)	1 per group	Supermarket
	BBQ Lighter / matches	1 per group / shared	Supermarket / hardware store
Water Forecasting Challenge (All sessions) <i>Note: Students may work in groups or as individuals. Adjust quantities to suit approach.</i>	Barometer: Balloons	1 – 2 per group	Supermarket
	Glass jar	1 per group	Supermarket / recycled
	Cardboard	A4 piece per group	Supermarket / stationary shop
	Masking Tape	2 – 3 rolls shared in session	Supermarket / hardware or stationary shop
	Rubber bands	2 – 3 per group	Supermarket / stationary shop
	Straws (drinking)	1 per group	Supermarket
	Toothpicks (optional)	1 per group	Supermarket
	Weather Vane: Cardboard	A4 piece per group	Supermarket / stationary shop
	Straws (drinking)	1-2 per group	
	Drawing pin	1-2 per group	
	Modelling clay	20-50g per group	
	Masking Tape	2 – 3 rolls shared in session	Supermarket / hardware or stationary shop
	Pencil with eraser on end	1 per group	Supermarket or stationary shop
	Paper plates	2 per group	Supermarket
	Rain gauge: Plastic PET soft drink bottles 600ml – 2L	1 - 2 per group	Supermarket / recycled
	Ruler	3 – 4 shared	Supermarket / stationary shop
	Pebbles (optional)	1 cup per group	Hardware shop recycled