



Survival Kit for the Imagination

Lesson 1.5

A Perfect Cloud for Rain

How Clouds Make Rain, Snow and Hail



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Objective:

Students learn how clouds make rain, snow and hail. Through scientific observation, creativity, and ingenuity, students see for themselves how clouds create precipitation in a jar. Through mindfulness, students practice gratitude in the face of life's stormy weather.

Lesson plans, links, and resources available at cloudappreciationsociety.org

Time: 45-90 minutes depending on activity options selected and teacher preference.

Materials

- Jar, Water, Old Fashioned Shaving Cream, Food coloring, Droppers
- Gratitude List printout
- A Perfect Cloud for Rain printout

Lesson Prep

- Print Gratitude List & Perfect Cloud for Rain
- Gather enough jars for each student to make their own rainstorm.
- Prep "UK Met Office" animated videos about precipitation
- Print poetry (Optional for SECONDARY)

Resources

- DIY Rainstorm in a Jar Tutorial and video <https://www.ehow.com/13559491/diy-rain-clouds-tutorial>
- UK Met Office animated videos about precipitation <https://www.metoffice.gov.uk/weather/learn-about/met-office-for-schools/other-content/other-resources/what-is-precipitation>

Poetry (for SECONDARY) relating to clouds and precipitation:

- 'Summer Shower' by Emily Dickinson: www.poemofquotes.com/emilydickinson/summershower.php
- 'The Storm' by Edward Shanks: allpoetry.com/poem/8562149-The-Storm-by-Edward-Shanks
- 'The Cloud' by Percy Bysshe Shelley: www.poetryfoundation.org/poem/174384
- "Bringing The Rain to Kapiti Plain" by Verna Aardema https://youtu.be/u_d4WKGbJt8

Previous Lesson Review

Clouds need the right conditions to form and specific ingredients. They are heavy and hide water inside them. Emotions can also be hidden inside of us.

Lesson Intro: Rain, Snow & Hail

If all clouds are made of water (droplets or ice crystals) what makes the water sometimes fall to the ground as rain or snow or hail? Reference A Perfect Cloud for Rain Photo Guide

When a cloud's droplets or ice crystals are really tiny it stays up in the sky because they are so small that the wind blows them around easily. Sometimes, the water in clouds falls down. When this happens we call it precipitation. It can fall as drops of rain, flakes of snow or frozen lumps of hail.



Streaks Reaching Down

When a cloud's droplets or ice crystals grow big enough they start to fall as precipitation. If the base of the cloud is low in the sky, they can land as rain, snow or hail. From a distance this looks like streaks reaching down to the ground.



Tall Clouds



Not only do clouds need to have low bases to produce precipitation, they also need to be tall. The taller a cloud, the more likely it is to produce rain, snow or hail. Why is this?

The taller a cloud is, the colder it gets up at the top. The colder a cloud gets, the more likely its tiny water droplets will freeze into ice crystals. Ice crystals tend to grow bigger than the droplets were and so they start to fall.

Sometimes Snow Never Lands

Sometimes the ice crystals falling from the top of a cloud melt on the way down and land as rain. Other times they fade away completely in the drier air beneath the cloud. They appear like streaks dangling from clouds. Cloudspotters call these fading streaks of water 'virga'. They are the jellyfish of the sky.



Dark Bases

Tall clouds have dark bases because the light from the Sun up above can't shine down through them. A cloud with a very dark base is a cloud that is likely to soak you because: dark base means tall cloud, tall cloud means ice crystals forming at the top, ice crystals at the top grow big enough to fall.



Precipitation Clouds

Which clouds make precipitation?
The two clouds that always make precipitation have 'nimbus' or 'nimbo' in their names: Nimbostratus and Cumulonimbus. (Nimbus is the Latin for a rainy cloud.) The two clouds look different and make different styles of precipitation. Nimbostratus is a thick, dark, wet blanket of cloud that hangs around for a long time and rains and rains or snows and snows for a long time. This is a Nimbostratus:



Storm Clouds

Cumulonimbus is the storm cloud. It looks from afar like an enormous mushroom, spreading outwards at the top. It produces heavy sudden showers. Sometimes a Cumulonimbus produces thunder and lightning and hail. This is a Cumulonimbus:



The Making of Hail

As well as being the thunder and lightning cloud, a Cumulonimbus cloud can produce hail. It does this when the wind inside it goes up and down and around and around causing the ice crystals to grow bigger and bigger as layer upon layer of ice freezes onto them. A Cumulonimbus cloud is like a washing machine and freezer combined. If you could cut a hailstone in half, you can see the layers of ice.



Activity Options



NO PREP



Cloudspotting outside or accessing a webcam

Take a walkabout outside, if the weather is right. If it's pouring with rain, a flat overcast sky, or there are no clouds in the sky, go to the main webcam page and chose different parts of the world they want to investigate to see different clouds. Make the webcam link available so students can explore the world of clouds in their free time.

- Discuss how precipitation can be a pro or a con in various locations.
- Are there any rain clouds today? If so, what are the names?
- Recalling 5 Senses Mindfulness, discuss what students noticed today.
- Can they identify any of the three general types of cloud in the sky?
- Have students guess how heavy the clouds are in the sky.
- Question student how much easier it might be to see shapes in the sky as they have been paying attention to the sky.

Falling through a Cumulonimbus

Read the recount by Lt-Col. William Rankin of falling through a cumulonimbus from The Cloudspotter's Guide by Gavin Pretor-Pinney. Draw a picture of a Cumulonimbus and plot the pilot's descent as he is tossed about in the internal flow of the cloud being hit by hail and rain. The story is very visual and brings clouds to life.

Wild Weather Reports

Wild Weather Reports: Research some wild weather reports and find out facts such as the heaviest hail storms recorded, the most rain/snow to fall at the one time, latest (in calendar terms) snow recorded, etc.

SOME PREP



Poetry, Creative Writing & Multi-Media



Primary

Writing poems about clouds. Use each letter for a word.

- C clumpy
- L lovely
- O outside
- U umbrellas
- D dark
- S shiny

MetOffice videos on rain and clouds. Review prior to sharing with students to pick which ones you want to share.

Secondary

Cloud Reporting: Students can interview different types of clouds and create a video or podcast on the challenges and opportunities of being this type of cloud.

Poetry: Different poems suggest the different cloud types, children could read them and try to decide which cloud type they portray.

These two describe rain clouds:

- 'Summer Shower' by Emily Dickinson illustrates the water cycle!
- 'The Storm' by Edward Shanks expresses the passage of a Cumulonimbus storm cloud.

And this one suggests all the cloud types, with precipitation clouds included:

- 'The Cloud' by Percy Bysshe Shelley suggests all the cloud types.



Rainstorm in a Jar Activity

Primary



Secondary

Making a rain cloud shows students the process of water evaporating to make clouds, and clouds accumulating more water to the point of precipitation.

Materials: Jar or clear container, shaving cream, food colouring, water.

- Fill the jar $\frac{3}{4}$ full of water, which represents the air.
- Add a layer of shaving cream to the top representing a cloud, which represents tiny droplets of water.
- Allowing each student to take turns dropping a few drops of food colouring onto the shaving cream.
- When enough drops are added to the cloud, students will see the coloured drops fall through the water, representing rain.
- The water represents the atmosphere. The shaving cream represents a cloud of tiny droplets. The food colouring represents when the droplets grow large enough to fall.

See 'DIY Rainstorm in a Jar Tutorial' video for full instructions. And why not submit a video of your class completing this project to hello@cloudappreciationsociety.org so we can share it as a demo for other classes to watch?"

Secondary: Cloud Seeding Discussion



Rainstorm in a Jar can be fun for Secondary students as well as Primary. Consider adding a discussion about cloud seeding. This is the process of encouraging clouds to rain by introducing tiny particles that encourage the droplets to freeze into ice crystals and start to fall. Should we be trying to mess with the weather like this? What if it is intended to relieve drought?

MORE PREP



Alternative Activities



1. Rain, Hail, or Snow? Ask students to consider whether rain, hail, snow or no precipitation is most likely from each of these situations:

- A hot, sunny day on an island in the Caribbean? Rain.
- A summer's day with Altocumulus clouds? No precipitation.
- An autumnal day with Nimbostratus? Rain.
- A spring day with Cumulonimbus? Hail.

Look for thunderstorm time lapse videos by Mike Olbinski and watch.

Discussions and links of clouds to myths about rain gods. Researching and discussing the importance of rain in ancient Egypt flooding of the Nile.

Musical Thunderstorm. Create a thunderstorm musically (you can use voices, percussion, random objects). Make it start, build up, die down. Use this to start looking specifically at anger management, if your students are ready.



Primary: Watch the video "Bringing The Rain to Kapiti Plain" by Verna Aardema



Mindfulness

Gratitude Practice



Get students to talk about how the different types of precipitation make them feel. Do they like rain? Is snow better than rain? What do they think of hail? Does the way they feel depend on the climate they live in? Would someone who lives in a very dry part of the world like Southern California be likely to feel the same about rain as someone who lives in a very wet country like Norway?

Remember, when it is raining the sun is still shining above the clouds, and without rain we would have no water to drink. By making rain, the clouds change the salty water in the seas into fresh water we can drink. Some of the most beautiful skies happen after rain clouds have broken up and the blue sky breaks through.

Moving Through Storms

Have students consider that like the sky during a storm of rain, snow, or hail, the stormy clouds dissipate. The practice of having gratitude can help us move through stormy emotional situations in our lives. Gratitude is showing or having thanks and to return acts of kindness. Look for and expect the sunshine to break through.

Encourage students to explore and share what they are grateful for. Family, water, food, a house, school, clothes, their pet, or a friend. Then combine the cloudy sky, the stormy sky they don't like, with something they are grateful for. Even though it's raining outside right now, and I don't like the rain, I am grateful for pretty flowers, and the flowers need rain to be beautiful. Even though I'm sad right now, I am grateful I have friends to play with. This practice can become a routine in the classroom and life.

Primary

'Even Though' Gratitude:

Even though...

I am grateful for...

A simplified version is to have students list 3 things they are grateful for. This could include the word or a picture depending on the age.

Secondary



Gratitude Notebook: Students can keep a regular notebook or journal. Dot or bullet journals are very popular as they can be decorated and designed creatively. This can become a regular practice in class. A simplified version is to list things that one is grateful for, starting with a shorter list of 3, then 5, and eventually to 10 things. Discussions can include specific things to have gratitude for like the sky, family recipes they love at home, how a certain teacher makes them feel with positive praise, the sound of their best friend laughing, and how a raindrop reflects the sun early in the morning. Challenge these students to widen their lens of gratitude beyond what may typically be listed such as food, clothing, a house, and family.

Write a Poem

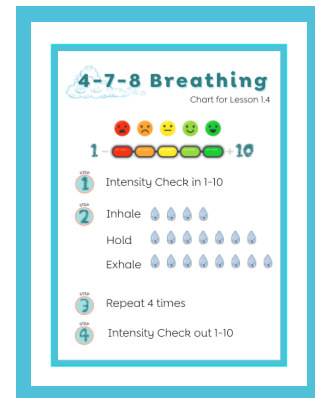
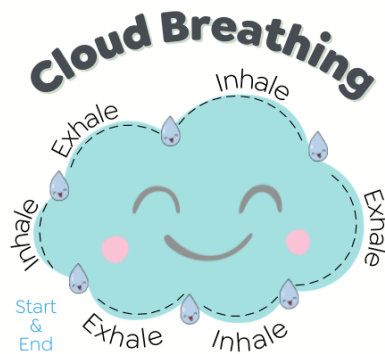
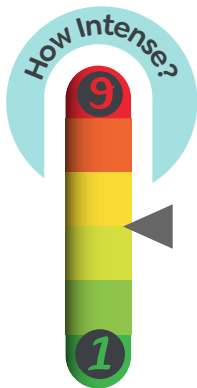
Secondary Mindfulness option: Read the following poem, then have students explore their recently experienced emotions and combine their knowledge of the clouds from past lessons. Share or post in a prominent place in the school.

From 'The Rainy Day' by the poet Henry Wadsworth Longfellow:

Be still, sad heart! and cease repining;
Behind the clouds is the sun still shining;
Thy fate is the common fate of all,
Into each life some rain must fall...

Review Previous Strategies

3 Mindful Breaths



Teacher Tip: Public vs Private



At times, a student may need a private prompting of what mindfulness strategies they know and a reminder to use it. At other times, one student may have a higher level of energy and needs calming down. First, bring all students' energy up with jumping jacks, hopping on one leg, etc. followed by a mindfulness strategy. Bring the whole group up and back down together.

Assessment

Recall the two clouds that always make precipitation have 'nimbus' or 'nimbo' in their names: Nimbostratus and Cumulonimbus. (Nimbus is the Latin for a rainy cloud.) Using Gratitude helps get through stormy emotional times.



Conclusion

Nimbostratus and Cumulonimbus are the main precipitating clouds. Their styles of precipitating are quite different – the first steady and ongoing, the other heavy and sudden. We know that just because it's stormy out and the sky seems angry, or may make us feel gloomy, we don't have to feel angry, gloomy, or sad inside. Precipitation is very important to help nourish rivers, streams, lakes and clean the water we drink. Although there might be storms in our lives, we can use gratitude to get us through the stormy times.



Photo Credits

- Sheet of falling rain by Julie Smith
- Virga (jellyfish clouds) by Robin Cole
- Tall storm cloud by Rigel Keffer
- Storm cloud with dark base by Tom Bean
- Nimbostratus by Donna Clifford Martinez
- Cumulonimbus by Christopher Watson
- Hail stone by ERZ (CC BY-SA 3.0)



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A Perfect Cloud for Rain

Lesson 1.5 Photo Guide



When the cloud droplets or ice crystals grow bigger they start to fall as precipitation. Sometimes, they fall all the way to the ground and land as rain, snow or hail. From a distance, they look like streaks reaching down from the cloud.



Praecipitatio spotted by Julie Smith



Why does precipitation land from some clouds and not from others? Rain, snow or hail is more likely to land from a cloud that has a low base. This is because it doesn't have to fall through so much air to reach the ground. Water falling from clouds that are higher up often fades away in the drier air beneath. This is when the streaks of falling water look like streaks dangling from clouds. Cloudspotters call these fading streaks of water virga. They are the jellyfish of the sky:



Virga spotted by Robin Cole



Clouds need to be tall to produce much in the way of precipitation. The taller a cloud, the more likely it is to produce rain, snow or hail. Why do tall clouds make rain? The taller a cloud is, the colder it gets up at the top. The colder a cloud gets, the more likely its tiny water droplets will freeze into ice crystals. And when that happens, the ice crystals up at the top of the cloud start to grow and grow until they become big enough to start to fall.



Cumulonimbus spotted by Rigel Keffer



Tall clouds have dark bases because the light from the Sun up above can't shine down through them. A cloud with a very dark base is a cloud that is likely to soak you because: dark base means tall cloud, tall cloud means ice crystals forming at the top, ice crystals grow big enough to fall.



Localised shower spotted by Tom Bean



Which clouds make precipitation? The two clouds that always make precipitation have 'nimbus' or 'nimbo' in their names: Nimbostratus and Cumulonimbus. (Nimbus is the Latin for a rainy cloud.) The two clouds look different and make different styles of precipitation. Nimbostratus is a thick, dark, wet blanket of cloud that hangs around for a long time and rains and rains or snows and snows for a long time. This is a Nimbostratus.



Nimbostratus spotted by Donna Clifford Martinez



A Cumulonimbus is the storm cloud, and this grows like a mountain in the sky, spreading outwards at the top like a huge mushroom. It produces showers that don't last very long but can be very heavy. Sometimes a Cumulonimbus can produce hail. The biggest clouds can make hailstones as large as tennis balls. This is a Cumulonimbus.



Cumulonimbus spotted by Christopher Watson



Why do some clouds make rain, some snow and some hail? Most of the time, precipitation starts as falling ice crystals up at the top of a tall cloud. Whether this lands as snow or rain depends on the air that it falls through on the way down. If the air below the cloud is warm enough, the ice crystals melt as they tumble and land as rain. If the air below the cloud is cold, they stay frozen and they start to stick together into flakes of snow.

As well as being the thunder and lightning cloud, a Cumulonimbus cloud can produce hail. It does this when the wind inside it goes up and down and around and around causing the ice crystals to grow bigger and bigger as layer upon layer of ice freezes onto them. A Cumulonimbus cloud is like a washing machine and freezer combined. If you could cut a hailstone in half you can see the layers of ice.



The centre of a large hailstone with alternate layers of opaque and transparent ice.



Sheet Lesson 1.5

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page. There are no margins or other markings on the paper.

Even though...
I am grateful for...

[illegible]

Handwriting practice lines (dashed lines) for the letter 'C'.



REMEMBER BEHIND THE CLOUDS THE SUN IS STILL SHINING