

Lesson 1.4 – How to Make a Cloud

What clouds are made of and why they're white

Objective: Through the use of creativity with art and an experiment students find out in this lesson the ingredients needed to make a cloud, why clouds stay up in the sky, and why some look bright white and some look dark grey. A mindfulness strategy will help students expand their awareness of emotions and body sensations, how to measure them, and calm down through observation of the breath.

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

Materials:

1. Paper/Pen/Pencils
2. Cloud Poster
3. Bottle
4. Matches
5. Water
6. Printables
 - a. Water Cycle Picture
 - b. Cloud Breathing
 - c. Cloud Breathing Cards

Lesson Prep:

1. Hang Cloud Poster if not already up.
2. Prepare bottles of water for each student.
3. Print in color Secondary and/or Primary printables.
4. Print in color Cloud Breathing Cards, laminate, one for each student.

Resources:

1. Cloud Poster (the water cycle part) for SECONDARY <not yet ready>
2. Water Cycle Picture printout for PRIMARY <early draft>
3. Cloud Breathing printout
4. Cloud Breathing Cards printout
5. Video 1: [Why some clouds look bright and others look dark](#)
6. Video 2: [How to make a cloud in a bottle - 60 Second Science](#)
7. Video 3: [Cloud in a bottle \(more advanced\)](#)
8. (Optional for PRIMARY) Video 4: [Bringing The Rain to Kapiti Plain by Verna Aardema](#)

Review previous lesson: Spotting and naming clouds is a science. Remind students they are scientists when they use the latin names to observe clouds. Calming the body and mind down with mindfulness will allow us to spot cloud lookalikes. Encourage students to share out for a few minutes what lookalike clouds they spotted since last time.

Lesson Intro: How much does an average cloud weigh and why does it stay up?

We learned last time that a cloud is made of little bits of water. The low clouds are made of droplets and the high clouds are made of ice crystals. There is more water in a cloud than you might think. Take a look at this Cumulus cloud. How heavy do you think the water is in this cloud?



How much does the water in this cloud weigh?

1. The water weighs as much as a bathtub.
2. It weighs the same as an elephant.
3. It weighs the same as 80 elephants.

The answer is 80 elephants!

So if the water weighs that much, how come the cloud stays up in the sky? Ask students to try and come up with ideas for why the cloud stays afloat.

PRIMARY: we are looking for simple answers: the wind pushes them up,

SECONDARY: we are challenging them to give a more detailed description of what they remember from previous lessons:

- Low clouds like this Cumulus are made of tiny water droplets.
- If the water in a cloud like this was joined together it would not stay up because it would be much more dense. Instead, each droplet is very small and there is lots of air between them so the cloud is much less dense than a continuous body of water.

Why doesn't a cloud fall down?

Each droplet of water in an average Cumulus cloud might be just 0.005mm in diameter, which is about a tenth of the width of a human hair. Since each droplet is so light, it is easily blown about by air currents. Only if the water was in much larger drops would it fall down. We see this collection of tiny droplets as a solid-looking cloud, but it is in fact more like a patch of fog.

If a cloud is made of water, why isn't it see-through?

The tiny droplets or ice crystals of a cloud scatter the light and this makes them look bright white or dark grey, as explained in this video:

['Why some clouds are bright and some clouds are dark'](#) video

Activity Options:

Option 1a (No preparation): Cloud in a bottle demonstration video

PRIMARY

Class watches a video of this demo. <CAS will do our own version of this video. It is suggested that this video is too simplistic. When we make our own video, add more scientific explanation for the secondary students> <https://www.youtube.com/watch?v=G70y90BVes4>

SECONDARY: Watch the video the first time with no sound, having students speculate what is happening during each step, followed by class discussion and ideas. Watch the video a second time with the sound on and discuss what they learned.

Option 1b (No preparation): Writing a Cloud Recipe and Drawing a Picture

PRIMARY: Provide sentences for students to give the sequence for the cloud recipe.

1. Take some air

2. Add some tiny pieces of dust or smoke
3. Cool the air
4. Watch as the invisible gas form of water condenses into tiny droplets
5. Close-up the droplets look like mist or fog. From a long way off they look like a cloud.
6. As soon as you warm the air again, the droplets evaporate back to water vapour and the cloud disappears.

SECONDARY: Get students to write out a recipe for making clouds. It should be something like: Take some air with water in it that is invisible because it is a gas. This could be like some of the air you breathe out. Add some tiny bits of dust or smoke, which will be what the droplets of cloud form onto, known as 'condensation nuclei'. Mix them up and cool the air. The invisible water vapour will form into tiny droplets on the dust particles. These look like fog close-up and they look like a cloud from a long way away.

Option 2a (Some preparation): Cloud in a bottle demonstration

PRIMARY: Cup your hands together and everything you need to make a cloud is in there. There is some water, but we just can't see it because the water is a gas. This form of water, called water vapour, is in every breath you breathe. Also present is some dust floating in the air, and this is needed for a cloud to form, because the droplets of the cloud need to form onto tiny particles. So how do you turn some air like this into a cloud? You need to make it cold, and the way to do that is to change the air pressure suddenly. This is how you make a cloud.

Each student has a clear water bottle. The teacher brings a box of matches. Children put some water in their bottles and teacher drops in matches and children try to make a cloud in their bottle by squeezing and releasing.

1. Fill water bottles about $\frac{3}{4}$ full.
2. Put the lid on the bottle, swirl it around. Squeeze the bottle 3-5 times.
3. Light the match and put in each bottle. The match soon goes out.
4. Now squeeze the bottle and watch as a cloud forms inside the bottle.
5. Postulate what makes the cloud after putting in the match?

The smoke allows the water to condense into droplets of cloud.

SECONDARY: Activity above plus exploring why the weather changes using the [Metoffice Weather Front Experiment](#).

Option 2b (Some preparation): Condensation demo

PRIMARY & SECONDARY: using individual mirrors, spoons, or glass (window), allow students to exhale onto objects to see condensation of the water droplets in their breath. This will only work easily if it is cold outside and so the window is cold or the objects, if left outside first, are cold. If it is cold enough outside, the students' breath may be visible. Use this as a way to show that there is water vapour, the gas form of water, in our breath and we can only see it if it cools enough to condense into water droplets, which appear as misty breath.

Option 3 (More Preparation): Cloud in a Bottle with rubbing alcohol and tire pump

PRIMARY/SECONDARY: Teacher brings in a large bottle, some rubbing alcohol, some matches and a bicycle pump. This makes for a more dramatic demonstration:

<https://www.youtube.com/watch?v=cXpuo3YHOn0>

PRIMARY: Watch the video [Bringing The Rain to Kapiti Plain by Verna Aardema](#)



Mindfulness: Learning from the magic of clouds

Water up in the sky can change very easily from being invisible to being visible. It can go from a gas called 'water vapour' to droplets or ice crystals which we see as a cloud. The gas form of water is in every breath you breathe out. Only when the air cools does the gas change to little droplets that we see as a cloud.

Just because you can't see something doesn't mean it isn't there. We don't see the water in clear air, but it is still there. And something can look one way from the outside, but be quite different close-up. A cloud looks like a solid white thing from a distance but turns out to be more like a patch of fog when you look close up, made of lots of tiny, tiny droplets or ice crystals.

Just like how we can't see all the small droplets and dust particles in clouds, people have feelings inside that we can't see. Just because we can't see them doesn't mean they aren't there. At times we can see when someone is sad or mad, but other times we may think they are fine when they are not. Someone could appear very different on the outside than they are feeling on the inside, just like clouds. This strategy will help us become aware of those hidden emotions inside that we may not know are there. Students will expand awareness of body sensations, how emotions can be hidden inside and not very easily be observed. Once students can name the emotion and the sensation that goes with it, they can begin to identify how intense or big the emotion is.

PRIMARY: Ask for students to identify an emotion they have or remember having. Younger children can understand that emotions can be very different like the clouds in the sky have different shapes and colors. They can learn to rate their emotions as little or very big, depending on how intense it is. Are they worried as wide as they can spread their arms, or a little as an erasure on a pencil? This can go for any emotion as a way for them to communicate how intense it is. Teach students to use the Big/Little scale on the cloud emotion chart and rate the intensity of emotions using the number scale 1-5.

SECONDARY: Have students identify an emotion then try to describe what sensation that feeling gives them in their body. Does it tickle, or squeeze their stomach? What about making them want to cry, or does it remind them as if the sun is beaming out of their smile? These charts can be printed and placed on the wall as a reference for identifying any emotions, or projected onto a classroom light board. Students with phones may access these charts from

online and download them to their phones for future reference. These students can use the 1-10 Cloud Scale to rate the intensity of emotions and sensations.

Students will recall this from lesson 2, however, we are adding on the assessment before Cloud Breathing, then also assess after. Either guide students through Cloud Breathing with the directions below or watch the video <not yet ready to review>

Cloud Breathing:

1. Identify a feeling you're having. Does it have a sensation of smooth, rough, hot, cold, tight? More sensations can be explored with the Emotions & Sensation Cloud Chart.
2. What is the intensity? White to dark?
3. Begin with finger on Start.
4. Inhale tracing the cloud to the next raindrop.
5. Pause a moment.
6. Exhale to the next raindrop and pause.
7. Continue to trace the cloud with inhale, pause, exhale pattern.
8. Re-rate the emotional intensity and sensation feeling again. Did it change in any way? If so, how did it change specifically?

Reassess feelings, sensations, and intensity. Students may see the number decrease, the sensation change, or the feeling go away all together, for the sad sort of feelings. Sometimes when students are too excited and need to calm down and focus, happy/excited feelings can be calmed down too. Once students see how the breathing exercise calms them down, but maybe not all the way, they can repeat until they get the results they are comfortable with (maybe their emotional intensity was an 8 and it drops down to a 4. That might be good enough for them to bring them out of a flight of flight response, introduced in Module 2).

SECONDARY: They will be able to understand that emotions can be different on the inside than what they portray, thus giving students an opportunity with My Hidden Feelings Chart, it might be the first time they acknowledge this difference and begin to seek help if needed. Students can begin to understand that emotions can be very complex, either they have a sensation that is uncomfortable and they don't know what it means, to having multiple emotions simultaneously, and sometimes those emotions may be happy positive emotions and sad, angry, and confusing ones.

Assessment: Have students recall the ingredients and conditions required to make a cloud. Ask what mindfulness breathing exercise they learned and when they answer, remind them they have their own tool to learn how to identify emotions, observe and feel their bodies and breath as they trace the cloud and become more mindful of the internal climate of emotions and sensations.

Conclusion: In order for clouds to form, the conditions must have the ingredients for them to form. They hide all the water they hold as we gaze onto them from so far under the sky. We know that clouds are very heavy, the tiny water droplets give them incredible weight. Next time it rains, look up and wonder just how much water the clouds were holding and guess how many elephants are raining down.

Feelings and emotions can also be hidden inside of us. It is important to learn to recognize the sensations we are feeling so that we can listen to what they are telling us. This can keep us safe. When feelings get too big, too intense, we can reach out to talk to a safe and trusted adult. Learning to manage our feelings through strategies like Cloud Breathing, will help us go through life knowing that emotions come and go, just like clouds, and that we have mindfulness tools to

help us manage them.

Alternative/Additional Activities:

1. Can link to myths about rain gods.
2. The importance of rain in ancient Egypt flooding of the Nile.
3. Children paint their own "Rainy Day"