



Survival Kit for the Imagination

## Lesson 1.4

# How to Make a Cloud

What Clouds are Made of and Why They're White



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## 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.

**Lesson plans, links, and resources available at [cloudappreciationsociety.org](https://cloudappreciationsociety.org)**

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

### Materials

- Paper/Pen/Pencils, Bottle, Matches, water
- Cloudspotting Chart Poster
- Water Cycle printout
- 4-7-8 Breathing chart and cards
- My Hidden Emotions printout
- Sensations Chart printout
- Cloud Recipe printout
- How Much Do Clouds Weigh? printout

### Lesson Prep

- Hang Cloudspotting Chart Poster, if not already up.
- Print charts, cards, & printouts
- Prepare bottles of water for each student.

### Resources

- Why some clouds look bright and others look dark <https://youtu.be/G70y90BVes4>
- How to make a cloud in a bottle - 60 Second Science <https://youtu.be/G70y90BVes4>
- Advanced Cloud in a Bottle Experiment <https://www.youtube.com/watch?v=cXpuo3YHOn0>

## Previous Lesson Review

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 do clouds weigh?

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 the Cumulus cloud in the Clouds Weigh printable. How heavy do you think the water is in this cloud?

How much does the water in this cloud weigh? Which answer is correct?

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!**



## Explore how clouds stay up

So if the water in an average little cloud 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 the cloud would not stay up because it would be much more dense. Instead, there's lots of air between the droplets 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 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.

## Why aren't clouds see-through?

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

## Activity Options

NO PREP



### Cloud in a bottle demonstration video

Watch the video of "How to make a cloud in a bottle- 60 second science."

#### Discussions

Primary: What ingredients make up a cloud? Water, tiny specks of dust or smoke, and a drop in temperature.

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.



#### Writing a Cloud Recipe & 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 known as water vapour. This could be like some of the air you breathe out. Add some tiny bits of dust or smoke, known as condensation nuclei, for the cloud droplets to form on. Mix them up and cool the air. The water vapour will condense on the particles as droplets. These look like fog close-up and they look like a cloud from a long way away.



## Cloud in a Bottle Demonstration & Condensation



### Primary

Step 1: 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.

Step 2: 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.

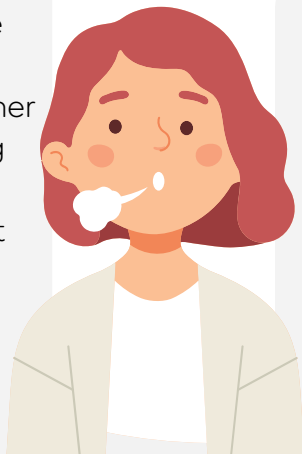
1. Fill water bottles about  $\frac{3}{4}$  full.
2. Put on the lid, swirl the water and squeeze a few times to increase the water vapour in the air.
3. Reopen the bottle, light the match, blow it out and right away drop it into the bottle to add smoke particles.
4. With lid on, tightly squeeze and release the bottle several times and look for a slight fogginess when you are releasing.
5. When you squeeze the bottle you increase the pressure which warms the air a little. When you release the pressure by un-squeezing the air cools a little. These slight temperature changes can be enough to make the droplets appear and disappear.



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.



### Condensation Demo

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.



## Cloud in a Bottle with Rubbing Alcohol & a 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 as shown in the video "Advanced Cloud in a Bottle Experiment."



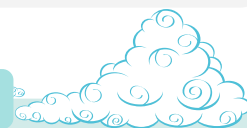
## Alternative Activity: Raindrop Storyboard

Students can produce a storyboard of images with writing to describe "Walter Droplet's" day. "His day started off in a puddle with all his mates. As the sun rose he could feel himself getting warmer and changing into a gas. He rose up into the air and began to get colder so changed back into a droplet. He continued to rise as he was buffeted by the wind. As he reached the top of the cloud he began to change to ice. He realised he was in a cumulonimbus storm cloud..."



## 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.



### Expanding Awareness

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/angry, 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 how big the emotion is.

## Emotion & Sensation Matching

Have a small discussion about sensations that match emotions. For example, feeling angry may have heat on the face, or tightness in the hands; make a fist together. For some, they may feel like yelling, a pressure in their lungs that has to be released. What sensation does feeling sad bring to your body? What about feeling low energy, wanting to lie down, or feeling like a nap, heavy eyes, watery eyes, or like you need to cuddle with a blanket? Explore the different emotions and sensations and encourage students to pay attention to when they have different emotions, what it feels like in their body, what sensation the different emotions bring.



### 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 emotion 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 posted on a screen. Students with phones may take photos of these charts for future reference. Students can use the 1-10 Cloud Scale to rate the intensity of emotions and sensations using the emotional scale.





## Somatization

When emotions manifest as physical symptoms, we feel these emotions as sensations. It is also called somatization. Students may complain of headaches, stomach aches, be tearful, want to avoid certain situations, or need extra attention. Help students understand, in simplistic terms, that sensations of nausea or a headache may be related to being scared or having anxiety about a math test, the loss of a pet, or a recent fight.

## Rating emotions and sensations intensity

Guide students through 4-7-8 Breathing using the 4-7-8 Breathing handout. Students may break into small groups or partners and guide each other multiple times to learn the process.



- Identify an emotion.
- Identify a sensation. Does it have a sensation of smooth, rough, hot, cold, tight? More sensations can be explored with the Emotions & Sensation Cloud Chart.
- What is the intensity?
- Complete four cycles of 4-7-8 Breathing
- Inhale 1-2-3-4
- Hold 1-2-3-4-5-6-7
- Exhale with pinched lips 1-2-3-4-5-6-7-8
- Assess again the emotional intensity and sensation feeling again. Did it change in any way? If so, how did it change specifically.



## Mindfulness benefits & why we rate the 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 Fight, Flight, or Freeze response)



## Secondary: Hidden Emotions Mindfulness Activity



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. They can have a sensation that is uncomfortable and they don't know what it means, to have multiple emotions simultaneously. Sometimes those emotions may be happy, positive emotions or sad, angry, and confusing ones.

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 Emotions get too big, too intense, we can reach out to talk to a safe and trusted adult. Learning to manage emotions through strategies like Cloud Breathing, Mindful Breathing, 3 Mindful Breaths, or 4-7-8 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. Encourage students to reach out to a counselor or a health care provider if emotions are too intense for mindfulness.

### My Hidden Emotions

Handout My Hidden Emotions Chart allowing students 5-10 minutes to consider the emotions they keep internal versus what emotions they may display externally. Encourage students to share with a trusted adult, counselor, or health care provider.



### Review Previous Strategies

**3 Mindful Breaths**

**4-7-8 BREATHING**

### Teacher Tip: Trusted Adults



Regularly encouraging students to assess their emotions increases their ability to learn emotions. Create a system that works for your classroom or students at their developmental level. Encourage students to identify a trusted adult they can talk to when they need to express their emotions verbally.



## 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 into them from below. We know that the liquid water in even an everyday Cumulus weighs a lot, but they stay up because the water is in tiny droplets that are wafted in the wind. Next time it rains, look up and wonder just how much water the clouds are holding and guess how many elephants are raining down.



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