Santa Barbara County APCD Clean Air Ambassadors, Lesson 3
Why is Coco Orange? – Sensors and Our Health

California Science Content:

K-2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
K–2-ETS1-1. Ask questions based on observations to find more information about the natural and/or designed world.
2-ESS1-1. Use information from several sources to provide evidence that Earth events can occur quickly or slowly.
2-ESS2-2B. Maps show where things are located. One can map the shapes and kinds of land and water in any area.
3-ESS2-1. Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.

Grades: 2nd and 3rd

Objectives: To demonstrate how the Air Quality Index is used to communicate air quality conditions. To inform students how to interpret the Air Quality Index Chart and learn how we can protect our health against air pollution, specifically particulate matter and ozone. To discuss how low-cost sensors collect local air quality data.

Materials:

- *Why is Coco Orange?* Book
- Laminated Fire & Smoke maps with scripts on back
- PurpleAir Low-Cost Sensor
- Air Quality Index (AQI) color code chart and cards
- Air Quality Index Magnets (1 for each student)
- Thank you note + magnet for the teacher!
- Classroom Daily AQI tracker (1 per classroom)
- Coco Says Game Rules
- Word Search Activity Page (1 for each student)

Introduction:

- Hi friends! How's everyone doing? We are so excited to be back in your classroom. Are you having a good day so far? Awesome, it is about to get

even better! Just to remind you, my name is _____and these are my friends _____and _____.

- We have learned a lot about clean air in the last two weeks. We saw how when the air is polluted, habitats get destroyed, as the Lorax's did. Then, we learned about how filters trap all that tiny particulate matter to keep it out of our lungs. Today, we came to talk to you about a cool tool we can use to see how much particulate matter is in the air, and brainstorm ways we can protect ourselves from air pollution!
- Now, we are going to read a fun story about different levels of air pollution and actions we can take to stay healthy when our air is dirty. The story is called *Why is Coco Orange?*
- While we read this story, we will have a very special guest, our chameleon friend here, Coco, to help share their story! Be careful, Coco has really sensitive ears, if you don't listen to the story, Coco might get sad!
- Before we start the story, can we all reach up high in the air for that special listening key? (demonstrate reaching into the air and grabbing an imaginary key) Great! Let's unlock our right ear, and now our left ear, and now let's put the key back in its hiding spot! Now reach your hands high into the sky and now plant those hands right in your lap.
    - (Demonstrate doing this, slowly, making eye contact with the kids who don't catch on right away.)
- Great! Keep those listening ears wide open as we read because I am going to have some questions for you after the story ends!

Procedure:

1. Have two Ambassadors read "Why is Coco Orange?" and pause on the following pages:

- Page 5:
    - "Friends, does anyone know what asthma is? That's right! Asthma is a condition that can impact the airways of our lungs, making it more difficult to breathe, especially when the air is dirty. It's always important to listen to your body if it's hard to breathe."
- Page 15:
    - "In Earth's upper atmosphere, ozone occurs naturally and makes up something called the ozone layer! Up high in the atmosphere, the ozone layer protects us by capturing super strong energy released by the sun that would harm humans if it reached Earth's surface."
    - "But when it gets to close to us, ozone pollution leads to dirty air, which can make us cough and feel sick!"
    - "Now repeat after me: ozone is good up high, bad nearby!" (Show card)
- Page 17:
    - "It's great that Kool, Coco, and KC are thinking about ways they can reduce air pollution! Carpooling, taking the bus, biking, and walking are all great ways to help reduce air pollution from transportation!"

- Page 19:
    - “Is anyone familiar with the Air Quality Index Chart? This chart explains how the Air Quality Index uses a color scale to communicate different levels of air quality. Can you guess the level of air quality the color green describes? That’s right, clean and healthy air!”
    - “Great job! We will talk about this tool more later!”

2. Discussion:

- After reading that story, why do you guys think it’s so important for children to breathe clean air and avoid dirty air?
    - That’s right, your bodies and lungs are still growing so it’s important to breathe in clean air, so you stay strong and healthy for the rest of your lives!
- Now, before we get to our awesome game, can someone remind me what air pollution is? That’s right! Air pollution is just a fancier word for dirty air!
- Remember when we learned about particulate matter when reading “Buzz the Electric School Bus” during our last visit? Awesome! Does anyone remember what particulate matter is?
- Particulate matter, also known as “PM” for short, is a type of air pollution! PM refers to tiny particles in the air that make it dirty, and it can come from many different things, like factories, ash and smoke from fires, dirt from roads, and gasoline or diesel-powered cars.
    - Hold up photo of dust from cars as an example.
- We can’t see Particulate Matter with our human eyes because they are so small! As you can see in this picture, PM10 can be about 9 times smaller than a grain of sand. PM2.5 is even smaller and can be about 30 times smaller than a single hair from our head! That’s super, super small!
    - Show infographic of particulate matter sizes.
- Particulate matter is especially harmful to human health because it can be so small that it can get into our lungs or even our bloodstream, and cause us to feel sick.
- Did you all enjoy the story about Coco? Awesome! I want to tell you about something really awesome that some super smart scientists invented now.
- So, this is called the Fire & Smoke Map (Hold up Fire & Smoke Map card).
- The Fire & Smoke Map is a special map that shows how much particulate matter 2.5 is in the air across the United States. It's called the "Fire & Smoke" map because it helps us understand how much air pollution is in the air during fires.
- The map shows us air quality data from low-cost air sensors and expensive air quality monitors that measure particulate matter pollution across the country.
    - Show photo slide of permanent air monitor vs low-cost sensor.
- Sensors are like special machines that can tell us how much pollution is in the air. They shoot out a laser and draw the air in. When the air crosses the path, air sensors count how much of each air pollutant is in that air.

    - Show photo and physical Purple Air Sensor.
- While the low-cost sensors help us understand local air quality conditions, the sensors only tell us about the levels of particulate matter in the immediate areas.
- After the sensors measures how dirty the air is, they can send the information to the websites online where you can find these maps (hold up smoke&fire map and monitoring station map)
- These maps tell us about the current air quality conditions by using the Air Quality Index, which tells us if our air quality is good, moderate, unhealthy, or even hazardous. (Hold up the color code).
    - Green means the air is clean and it's a great day to be playing outside!
    - Yellow means there is very little air pollution in the air, but it's still a good day to be active outdoors!
    - Orange means people sensitive to dirty air, such as kids, older adults, and those with asthma, may need to take more breaks if they're outdoors to avoid feeling sick.
    - Red means the air is dirty and everyone should avoid intense activities outdoors.
    - Purple & maroon colors mean the air is very unhealthy and everyone should avoid being outside as much as possible! Everyone should remain inside to protect themselves from breathing in dirty air.
- To find what the air quality index is here and see maps just like these, you can go on purpleair.com! (write on whiteboard for teacher if applicable)
- Let's look at how the Fire & Smoke map can help us during a fire event. As you can see on this map, it shows there was a fire right here (point to Los Angeles). Do you see the colors of the nearby air sensors and monitoring stations? (Show example of Fire & Smoke Map that shows a fire near LA & surrounding very unhealthy air quality)
- Yes, that's right! The air quality nearby the fire says it was very unhealthy because of all the particulate matter in the air from the fire!
- These maps are important because they help us understand how clean or dirty the air is across the country. They can help us make decisions about where we want to live or go visit to protect ourselves from air pollution.

Coco Says Game (5-7 minutes):

- Now, it's time to play our game! Has anyone ever played Simon Says? To remind you the rules when we say a color you're going to do the action that represents the color based on our rule sheet. If I say 'Coco says it's green' and you do the action, then you're still in the game. If I only say 'it's green' and I don't say 'Coco says first and you do the action, then you sit down until the round is over.
- Play a few rounds. In each round say ~ 7 different colors.
- Good Job everybody! Everyone quietly move back to your seats on the carpet so that we can finish up the lesson!
- It's important to know that air quality conditions can change quickly due to wind speed and direction, temperature, and other factors outside of humans' control. That's why it's important to check the Air Quality Index often when there are

concerns about air quality due to a wildfire or other event.

- Awesome friends! You guys really seem to understand how air sensors work now! Thank you all for playing the game so nicely.

Word Search (10 minutes):

- Next, we are going to be doing a word search! Have any of you ever done a word search before? We are going to give you a paper with a list of words that we've taught you about, and it's your job to find them, kind of like a treasure hunt!
    - Keep in mind that words can be found straight across, diagonally, and even backwards, so help out your friends when you find a word!
- Go back to your desks and we'll pass out the activity. Let one of us know if you are having any trouble finding the words!
- (As they are completing it Ambassadors should be walking around the classroom answering questions and helping any students who might be struggling. Ambassadors should also ask the students if they remember the vocabulary words in the word search, e.g. "Do you remember what pollution is?")
- Okay friends, time to sit back down! Remember you get to take these home so if you aren't finished you can finish them later. Next, we are going to tell you about a fun gift that we are going to leave for your classroom!

Classroom Daily AQI Tracker:

- We brought a gift for you to keep in the classroom so that you can track the air quality index everyday.
- Can you help your teacher remember to check the purple air sensor map website everyday and place Coco on the corresponding outside air quality?
- Awesome! Now, it's super important to check it everyday before recess so that you know if you should take breaks when you're playing.
- Today the air quality is *color*, so we can put Coco on the *color*
- Activity to correspond with tracker?

Wrap-Up:

- You guys have learned so much today about air quality! To wrap up our visit, we have a few final questions for you. If you think you know the answer, raise your hand high to the air and we might choose you to answer!
- Q: Can you see dirty air?
    - A: This one is tricky! Sometimes you can see if the air is dirty, but not always. Remember, we humans can't see ozone or particulate matter pollution in the air, which is why the Air Quality Index helps us know if the air is clean or dirty.
- Q: What time of day would there probably be the most ozone in the air?
    - During the afternoon because ozone is created when chemicals react with heat and sunlight in the air! That is also why ozone levels are higher in the summer than the winter due to the hotter temperatures.
- Ok, last question!

- Q: If the air quality color is red, what does that mean for the air outside?
    - A: The air is dirty, that's right! If the air quality color is red, you should take more breaks when playing outside and move activities inside if you start to feel sick.
- Great job everyone!
- Before we go, we would love to give each of you an Air Quality Index Chart magnet to take home with you! You can refer to this magnet if you ever forget how to read the Air Quality Index to determine if the air is clean or dirty. We want you to have these magnets to remember all that cool stuff we learned together and share your knowledge with your friends and family.
- (Pass out a magnet to each student or leave enough magnets with the teacher)
- Now that you are all officially Junior Clean Air Ambassadors, can we do our Clean Air chant one more time? Great!
- Can everyone stand up on their feet and take one step back? Great! Watch and I do it first, then we will do it all together!

    When I say "Clean", you say "Air"; "Clean",

    "Air"; "Clean", "Air";

    slap slap - clap clap - snap snap;

    "Clean Air!!"
- Awesome! Thank you all for learning with us the last three lessons, we had so much fun with you all!