

Santa Barbara County APCD Clean Air Ambassadors, Lesson 2, Buzz the Electric School Bus - Transportation & Our Choices

Targeted Grade: 2nd & 3rd

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.

- A situation that people want to change or create can be approached as a problem to be solved through engineering.

3–5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

3-ESS3-1.B. A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts.

3-LS2-1. Cause and effect relationships are routinely identified and used to explain change.

Objectives: To demonstrate how different forms of transportation can impact air pollution. To explain how particulate matter filters are used in vehicles, such as diesel school buses. To discuss how these filters reduce air pollution and protect our health. To inform students about how air filters capture particulate matter.

Materials:

- *Buzz the Electric School Bus* Book
- Laminated vocabulary photo cards
- 2 School Bus Posters
- Expo Markers + eraser
- Tupperware of marbles
- Tupperware with holes
- Construction paper strips with clean transportation ideas
- Air filter from wall
- One clean filter
- One dirty filter
- Matching card game
- Snap bracelets

Introduction:

- "Hey Everyone! Are you having a good day so far? Great! We are too!"
- "Did anyone plant their mustache seeds yet? I hope you get some butterfly visitors soon!"
- "Just to remind you, I'm _____ and this is _____ and we come from Santa Barbara County's Air Pollution Control District. We work to help

keep our air clean!”

- “Last week we read a silly story about the Lorax, whose friends had to go away because the air got way too dirty!”
- “Does anyone remember what was making the air dirty? It was that building that was making the thneeds...That’s right a factory! (*Hold up factory vocab card*) Factories can be helpful because that is how all of our things are made. But, as we saw in the story, factories can also make the air very yucky.”
- “Can anyone think of other things in our world that make our air dirty?” (If students can’t think of something on their own, suggest cars to get the ball rolling ... other answers: airplanes, trucks, fires, trains, volcanoes, rocket ships, etc.)
- “That’s right! There are a lot of things that make our air dirty. (*Hold up the pollution make dirty air!*)”
 - “Even though there are a lot of factories, cars, airplanes, etc. in our world, is the air always dirty? No way! This is because some really smart scientists came up with a technology to help fix air pollution problems (*Hold up air pollution vocab card*).
 - Can anyone tell me what they think air pollution is? That’s right! Air pollution is just a fancier word for dirty air. It causes problems for people and nature because no one wants to live in a world of yucky air!”
 - “Has anyone ever heard of or seen an electric vehicle?” (Ask for quiet volunteers to share what types they’ve seen)
 - “Well, today we are going to read a silly story about an electric bus and other ways super smart scientists have helped with air pollution problems in our world. They do this by using a technology called filters. Can everyone say that word with me, ‘filters’? Great! Now we are going to learn a little bit about our friend Buzz.”
 - “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 one **Ambassador** read “Buzz the Electric School Bus” while the other ambassador pauses on the following pages:
 - Pg. 1 “Does everyone know what an electric vehicle is? Quietly raise your hand if you’ve ever been in an electric vehicle.”
 - “Electric vehicles are great because instead of using gas or diesel that produces dirty air they rely on batteries. We’ll learn more about this later on in the book... let’s keep reading.”
 - Pg. 6 “Ok everyone. We just heard two new words. Can everyone say air pollution with me? ‘Air pollution’. Air pollution is just another word for dirty air. Now, can we all say particulate matter? ‘Particulate matter’. Particulate matter are the tiny pieces that

make up air pollution.

- Pg. 9 “Alright, so filters are a very useful thing that scientists created. The dirty air flows through one side and gets trapped inside the filter like a sponge so that only clean air can go through the other side.”
- End of story
 - “Could I have a quiet hand tell me what you learned from this story? That’s awesome! In Buzz’s story, there are filters in the buses. There are actually filters in this classroom too! Could you quietly point to where you think they are? “
 - Go through questions at the end of the book
 - “Filters and electric vehicles are a great way to help keep our air clean.”

Discussion:

- “Now, Can someone point to air in the room? Can someone else point to the air in the room?”
 - “That’s right. The air is all around us”
 - “So, if there was some air pollution in that back corner, would it stay in just that corner or would it spread around the room?”
 - “That’s right! Air can travel anywhere and everywhere it wants!! So, when there’s something in the air it might travel to other places”
 - This is why filters are so important because they stop the spread of dirty air!”
- “Why do you think air is important to us?”
 - “Yes! We need air to breathe! Plants need air to grow!”
 - “I want everyone to take a deep breath- breathe in through your nose and out through your mouth.”
 - “What did you just breathe in?”
 - “Air, right!”
- “Do you think if you had a bunch of pollution in your lungs it would be easier or harder to breath? Why is that?”
 - “Breathing polluted air means we get less **clean** air into our lungs!”
- “How do electric busses help us keep the air clean for us to breath?”
 - “That’s right! It’s because they don’t create smoke in the air from the gas.”
- “Filters are a great way to make sure only clean air gets into our lungs. My friend took this filter out of her wall at home so I could show you! Would you all like to touch it? It feels kind of silly.

- Can everyone raise two gentle fingers into the air? (Demonstrate raising two fingers) Great. We will use these gentle fingers to feel the filter. Only two fingers at a time because we don't want it to break (pass the filter around to the kids, keeping it on the table and reminding them to use gentle fingers, everyone gets a turn).
- This machine sucks in all the air from the room and sends it through this filter and pushes clean air out the other side. Here, is the part that traps the yucky stuff in the air (hold up the black filters).
- Now, one of these filters is much newer and cleaner than the other. Can you guess which one is dirtier? Why? That's right! This one is much dirtier than the other one.
- Would you guys like to touch these filters? Okay, hold up those two gentle fingers one more time. I am going to pass them around now, touch them very softly. (Pass around black filters and ask kids what they think / how they feel).
- I need another volunteer now! Can you raise your hand if you would like to be my helper for this next part? (Choose a student who hasn't been chosen yet)
- Great, thank you for volunteering. Come on up by me. Now your classmates are going to tell me if they can see you through this filter... (hold up dirty air filter in front of the volunteer) Can you guys see your friend? No way! (Switch to cleaner filter) How about now? Yes! Awesome thank you volunteer, you can go back to your sport now. Now we can see how filters get dirty over time because they trap all that particulate matter in the air. You can tell if a filter needs to be replaced when you can't see through it anymore.
- Does anyone see a filter in this room? (Point out the air filter) That's right! That filter works hard to make sure only clean air gets into your lungs!
- "Are you guys ready to do some science experiments?"

Activity:

"Alright, I'm splitting you guys in half. You all on the right stick with me. We will be on Bus 2. The rest of you can go with "_____ " on Bus 1!" This is your bus group. We have some super exciting activities for you all! Before the buses leave the station, you guys have to pick a name for your bus."

Gather students around you in a circle and help them come up for a creative name for their bus. Write the name on the whiteboard of the bus and have the kids line up in a single file line behind you.

"Are you guys ready! Let's hop on and start up the buses"

"Hey Bus 2, what is your new and improved bus name? Wow! That's an awesome bus name. Our bus is called _____""Now before we get going, let's make sure we all have our seatbelts on! (Demonstrate putting seatbelt on with the kids) Great! We are ready to

go! Can I get a "beep beep!" Awesome! Bus 1 friends, do you mind staying in your station while our bus passes you by? We'll see you soon!" (It really minimizes chaos if you have one bus group travel toward station 1 while the other watches and waves bye, and then the other bus group can move to station 2 while bus 1 is "unloading").

"OK everyone, time to get off the bus! We are at our first station! Gather around the table here, but please do not touch my materials. They are very important for our experiment." (Be clear if you want kids to stand around the table or find a chair ... either is fine but make sure there are enough chairs if that is what you do).

Bus Stop #1- Filter Demonstration and Chain Links

1. Ok friends, this station is going to show you how filters take dirty air and make it clean! I want you to imagine the colorful, large crystals are particulate matter and the clear marbles are clean air. Do you remember what particulate matter is? Particulate matter is all the tiny particles that make the air dirty. They can come from many things, like factories, fires, and cars.

2. Now, friends, I am going to need some volunteers to tell us where the air pollution is coming from! Remember all the air pollution sources we talked about earlier? (Hold up air pollution source card). We're going to take turns saying where the pollution is coming from and then you can drop the crystal, dirty air, in with the clean air.

3. I'll go first. This crystal represents particulate matter particles from a wildfire. Where does this dirty air come from? (Have each student take turns saying where the pollution is coming from and dropping a marble into the jar)

4. Great work friends! Now show me your empty hands and reach them high in the air! Great! Can you reach them a little bit higher? (do this with them, making eye contact with the kids who aren't doing it) Great. Now I want you to plant your hands by your sides. 1,2,3 plant those hands. Great. It's important we keep our hands down while we do this experiment.

5. Now that we have made our dirty air (Hold up jar of marbles with dirty air vocab card) it is time to use this filter (hold up grate) to separate the clean air (hold up clean air vocab card).

6. Now, can I get some ideas of what you think will happen to the air when shake the containers with the filter on? (Ask for one or two volunteers to give a hypothesis) Yes, we will know our filter works if it traps all these crystals, the dirty air particles, and only lets the clean air particles pass through. Can I get a countdown for our experiment? 3,2,1! (Put the lids of the containers together and pour it upside down shaking it slightly, allowing the crystals and marbles to separate into different containers.)

7. Now, let's see if our filter trapped all the dirty air particles (separate slowly) yay! The filter

worked! All of the dirty air was filtered out of the clean air, and this shows us how air filters can filter out yucky stuff from the air we breathe!

****If you are the first group at this station, take off the grate, put pollution marbles back in another container. Pass out the construction paper strips for the clean air chain****

8. Ok so now we know how we can use filters to clean the air, but we can also keep the air clean by using clean transportation. Can you think of any ways that you can get somewhere, like to school, without using a gas-powered car.

I would like us to make and clean transportation chain now! I will pass out a strip of paper to each of you, and I want you to your strip say and think of another way you can reduce air pollution. Write it down and then you can decorate your paper, I will link them all together to create a big chain! (Staple the links together as the students finish coloring.) So, remember, by not using gasoline, we can all help prevent air pollution and keep our air clean and healthy!

Ok friends, time to get back on our bus. Can I have a new volunteer to be the caboose? (Pick someone who wanted to do the filter but didn't) Line kids up single file, put seatbelts on, and do a "beep beep!" Great, the bus is leaving the station. Don't get off the bus until I tell you where to go!

****Coordinate with other group to switch stations****

Ok, let's park the bus here. Everyone go ahead and take those seatbelts off, and gather around this table. No touching my materials, we will get a chance to later!

****Be clear if you want kids to stand around the table or find a chair ... either is fine but make sure there are enough chairs if that is what you do****

Bus Stop #2 - Real Filter and Matching Game

1. At this station, we get to play a fun game where we learn about some things that might need filters. (Do the next part for as long as you need to fill the time while the other station finishes up. Okay to skip some cards!)
2. We are going to go around the circle, and each friend will flip over two cards. If the pair you pick up is a word matching to its picture, you will tell me whether the card is something that needs a filter or not.
3. Go through as many cards as you have time for, pausing after every few cards and asking "Can someone raise their hand and tell me, why is this card in that pile?"
4. After the bike and scooter cards, say "Now friends when you ride your scooter/bike, if you looked behind you, would you see any air pollution coming out of it? No way! Bikes/scooters are a great way to help keep the air clean!"

5. Awesome friends! We won the game! You matched all the cards correctly. Time to get back on our bus. Can I have a new volunteer to be the caboose?
(Pick someone who wanted to volunteer but didn't get chosen) Line kids up single file, put seatbelts on, and do a "beep beep!"
Great, the bus is leaving the station!

Ok, lets park the bus here. Everyone can go ahead and find their spot back on the carpet so we can regroup with our other bus group friends!

Wrap Up:

Welcome back second graders! How was your bus ride? Which station did you like better, the real-life filter or the air pollution experiment? Awesome!

Now, can anyone raise their hand quietly and remind me what does a filter do?

That's right! Filters help keep our air clean. Now, friends, there are some things we can do, besides use filters, to help keep our air clean. Can you think of anything? Raise your hand if you have a guess...(Possible answers- walking, riding a bike, skating, scootering, use an electric vehicle etc.)

Awesome friends. You just came up with so many ways to help prevent air pollution!

Now it's time to reveal our clean transportation chain. (Ask for two volunteers to hold each end and take slow, small steps backways to reveal the chain.) If you see your paper, stay seated but point to where it is.

Now that you know some ways to get around without using a gas car, we have a special gift for you! Each of you will get a reflective snap bracelet. You can wear it when you're walking, biking, or riding your scooter to help keep you safe. We'll give them to your teacher to pass out at the end of the day.

- "Well, that wraps up our lesson for today. But before " _____ " and I head out, let's do the Clean Air Chant!"
- 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!!"

Amazing! Go ahead and take a seat back on your rug. Thank you so much for hanging out with us! Have an awesome rest of your day!

Thank the teacher for having you and pack up.