

APCD Clean Air Ambassadors, Lesson 2

The Magic School Bus - Filters to Protect Our Health and Environment

Targeted Grade/Levels: K - 4

Objectives: To demonstrate how dirty things filters are used in vehicles, such as school buses. To discuss how these filters reduce air pollution and protect our health. To inform students about the dirty things air filters capture. To teach alternative options for using gas and diesel on a day-to-day basis.

California Science Content: K.3.c. *Students know* how to identify resources from Earth that are used in everyday life and understand that many resources can be conserved. K.4.d. Compare and sort common objects by one physical attribute (e.g., color, shape, texture, size, weight). 1.1.b. Students know the properties of substances can change when the substances are mixed, cooled, or heated.

Materials for Demonstration:

- “The Magic School Bus Gets Cleaned Up” book
- Hydrogen car engine model
- Cardboard school bus

Materials for Activities: -

- Computer and projector
- Two water bottles (one clean, one dirty)
- Coffee filters
- Sand or dirt
- Pitcher to catch water
- Paper towels
- Funnel
- Two sets of matching games on index cards
- Air filter machine
- One clean/unused filter
- One black/used filter

Introduction:

Frist, open all links on the computer necessary for the lesson. Volume/speakers turned on for EPA visual, but YouTube video volume off.

- “Hey Everyone! How was your week? Did you plant your mustache seeds yet?”
- “How many of you ride the bus to school everyday?”
- “It’s a great idea to ride a bus because sharing a ride to school with your classmates is better for the environment than each driving in your own car”
- “Did you know that buses use diesel fuel to run?”
- “Diesel fuel is similar to gas. But small cars use gas. Big trucks use diesel. It is used to power big stuff, like buses, trains, and big boats. It’s bad for our environment.”
- “Luckily some very smart people have figured out ways to lower the pollution from buses. We will be talking about this cool technology in class today.”

Procedure:

1. Introduce “The Magic School Bus Gets Cleaned Up” characters and then read the book aloud & discuss the questions listed below.

- “This is going to be a special reading of the magic school bus, where Maya and I will each be characters from the book.
- “I am going to be Ms. Frizzle (show mask), she is the teacher in the Magic School Bus ANNNND I will also be Dorothy Ann (show mask), she is one of Ms.Frizzle’s students. Just like you guys are Ms. Ball’s students!”
- “And I will be another one of Ms. Frizzle’s students, Arnold! I also happen to be Dorothy Ann’s friend!”
- Pg. 2 - “when air gets dirty”
 - Ask students: “Do you guys remember what air pollution is?”
 - Air pollution is harmful material in the air that is bad for plants, animals, and humans
- Pg. 18 - diesel filters - “clean as a whistle”
 - Ask students: “Do you guys remember what diesel fuel is?”
 - “Diesel fuel is similar to gas but it powers big trucks and buses like the Magic School Bus for example!”
 - “It’s bad for the environment because it creates a lot of air pollution”

Discussion:

- “Can someone point to air in the room? Can someone else point to the air in the room?”
 - “The air is all around us.”
 - “So if someone polluted the air in this room do you think it would stay here forever?”
 - “No. Good! Air can travel anywhere and everywhere it wants!!”

- “Why is air important to us?”
 - “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!”
 - “What parts of the body help you breathe?”
 - Example answers: lungs, nostrils, mouth

- “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!”
 - “Who here has asthma? So if you have asthma it might be hard to breathe even when the air is clean! It would be even more difficult if the air was dirty so that’s why it’s so important that we keep the air clean.”

- “How can we help lower the amount of dirty air we breathe?”
 - Example answers: filters, walk/bike to school, carpool
 - “Do you know what exhaust is?”
 - “Exhaust is made of leftover dirty things from the engine. It comes out of the tail pipe and can be really unhealthy if it gets into the air we breathe. That’s why it’s so important to use filters to keep our air clean.”

 - “So we have been talking a lot about buses needing filters to clean their exhaust.”
 - “Another way to keep the air clean is to use cars that don’t use harmful fuel for power in the first place”

- “Do you know the different ways we can power our cars?”
 - Diesel, gas, electricity
- What do each of these do to the environment and our health?
 - Diesel is very very bad/negative for our health and the environment because it gives off the most air pollution of them all!!
 - Gas is bad/negative for our health and the environment because it also gives off a lot of air pollution!
 - Electricity gives off 0 air pollution! No exhaust at all! Electric cars are very good for the environment.

Activity:

“Alright, I’m splitting you guys in half. You all on the right stick with me. The rest of you can go with Maya. This is your bus group. We have some super exciting activities for you all! Before we get started, you guys have to pick a name for your bus. Also, can I get I get one volunteer from each bus group to be the caboose?”

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

“OK everyone, time to get off the bus! We are at our first station”

Bus Stop #1 - Interactive Map

- “Ok, so one super cool thing that some scientists found out was to see how much air pollution there is in places all over the world.”
- “These scientists even made a map that can let us look at the air pollution right now in lots of cities! Before we show you the map, I want to explain to you guys how it works.
- These are the things that measure the air pollution in the air. They take in air and use lasers to see how many little dirty things are in the air. Every dot on the map is one of these around the world.
- The dots are different colors when the air is clean or dirty. The colors range from green to purple. If I told you that it was a green day, do you think the air would be clean or dirty? What about on a red or purple day?”
- “Great job! Just to make sure we fully understand the different color days and

what that means about our air, we have a little helper to teach you more about air quality.”

- What Color Day Interactive Game:
 - <https://www3.epa.gov/airnow/k1/purple.html>
 - “Our bodies can handle some air pollution naturally, but at high levels our bodies cannot handle.”
- Show the Purple Air map on a Smartboard or TV (if possible).
- Show the air pollution level in Santa Barbara
 - “So in Santa Barbara the air is really clean and only sometimes is the air really dirty. Like when the Thomas Fire happened.
 - “When the Thomas Fire happened, do you think the air would be green or purple on the map?”
- Choose one student to click on a random spot on the map and explain it to your classmates.
 - “Let’s look at some different places on the map. Where do some of you relatives live can anyone raise their hand and tell me?”
 - “Ok. Would anyone like to volunteer and help me? I need a helper who can find a circle on the map and tell me what it means.”
 - “Why do you think that the air might be worse (or better) at this location than in Santa Barbara?”

We are so lucky to live in Santa Barbara where we have very little air pollution!

Bus Stop #2 - Filters

- “Like we read in the Magic School Bus, filters are really important for keeping our air clean. How do filters work?”
 - “Imagine a fish swimming freely in a river, then it gets stuck in a net because its too big to go through the little openings in the fabric”.
 - “That’s how an air filter works to catch the pieces of unhealthy things floating around in the air”
 - They come in all different shapes and sizes
 - Can be made of hundreds of chemicals
 - And they’re what make up Air Pollution”
- “We’re going to do an experiment to see how filters work”
 - “Here’s 1 clean water bottle and 1 dirty water bottle - filled with sand”
 - “What if this is all that you had to drink?”
 - “Would you want to drink the water?”

- “No - right”
 - “Imagine that this dirty water is actually polluted **air**”
 - “Would you want to breathe that in?”
 - “No, right! Let’s see how we can clean it with this filter.”
- “We will dump this dirty water through a filter that will separate out the dirty icky stuff, leaving us clean water”
- “Do you see how clear the water looks now?”
- “All this sand we filtered out of the water shows you how an air filter can filter out that unhealthy dirty stuff from our polluted air.”
- “Can someone volunteer to come up here and do the demonstration for your classmates? If you do this activity, you won’t be chosen to do the next one, that way everyone gets a chance to try!”

Bus Stop #3:

- “This machine right here is an air filter!”
- “It’s a real life version of the water bottle experiment we just showed you. But it filters dirty air instead of dirty water”
- “Why do you think people use these?”
 - Answer: “To make their air clean and healthy to breathe”
- “It sucks in all the air from the room, sends it through a filter, and then pushes clean air back out the other side”
- “It filters dust, pollen, bacteria, and other things that are so tiny that you can’t even see them. These are really unhealthy to breathe in so that’s why air filters are so important.”
- “Here we have one clean, completely unused filter. And one dirty, used filter.”
 - “The difference is shocking!”
- “When there’s a lot of dirty things floating around in the air, it is dangerous to our health and bad for the environment”
 - “A lot of Air pollution make us feel sick”
 - Even making it hard to breathe; making you cough
- “So air filters make our air healthier for humans and animals to breathe!”
- “We want to show you a video of how dirty things enter into human lungs”
 - Video: <https://youtu.be/vYSAPwQwMTkg>
- “Now that we’ve seen how dirty things can enter inside our bodies, nobody wants that inside them, right!”
- “What a simple solution to catch all the gross dirty things floating around in the air - Filters!”

Bus Stop #3 - Matching Game

- Teach students about where certain pollution comes from
 - Smog from factories, exhaust from cars
 - Return to your desks and get into roughly 4-6 groups
 - Distribute the matching games to each group
 - “We are going to pass out some matching cards to each of your groups. Your job is to match the match the photo of each pollutant to where it comes from!”
 - “You have 5 minutes - go!”
 - “Great job guys! You looked busy. Next, we are going to have each group show one of your matches to the class!”
 - **“What is the pollutant?”**
 - **“Where does the pollutant come from?”**

“We have talked about a lot today, let’s review!”

Discussion:

Questions to discuss after reading the book:

- “Why are dirty things, the stuff that makes up air pollution, bad for your health?”
 - Answers: “bc it can get trapped deep inside your lungs and make it hard to breathe”
- “Will someone remind me where some of these dirty little things come from? Think about the matching game we just did...”
 - Example answers: diesel exhaust, factories, chimneys (burning wood), cows, wildfires, air planes, cars, etc
 - Remember, exhaust is made up of tiny little dirty things (bits and pieces) that can get inside your lungs if you breathe it in.
 - Luckily, thanks to filters, our air gets cleaned and our health is better!
- “On top of using a filter to clean the air, we can also try to use less gas or diesel, bc we know these things create a lot of air pollution”
- “How can we use less gas and diesel on a day-to-day basis?”
 - Answers: walk, bike, scooter, share rides/carpool, take the school bus, take the train down to LA

- “Remember, we can also use an electric car or hydrogen car. These don’t use any gas or diesel to run. Both of them give off 0 air pollution.”
 - “Let’s take one more breath all together. Breathe in through your nose and out through your mouth.”
 - “See how easy is it to breathe!”
 - “Let’s keep our air clean by practicing good habits that don’t make air pollution. Like biking, walking,, and so much more!”

Transition:

- “Well, that wraps up our lesson for today. But before Michaela and I head out, let’s all recite the Clean Air Chant!”
 - *When I say “Clean”, you say “Air”;*
“Clean”, “Air”; *“Clean”, “Air”;*
slap slap - clap clap - snap snap;
“Clean Air!!”
 - We hope you guys had fun today, I know Maya and I sure did! We are going to miss you, but you guys are now officially our Junior Clean Air Ambassadors!
 - Do you know what that means?
 - It means that now you know all about air pollution, you can help spread the word and keep our air clean in Santa Barbara!
 - “Thank you everyone for making our last lesson a lot of fun! Remember to practice good habits to help keep the air in Santa Barbara clean and an awesome place to play.”