CO2 in Car Exhaust

Summary

Students will investigate the carbon dioxide content in different types of cars.

Time Frame

4 class periods of 45 minutes each

Group Size

Small Groups

Life Skills

Thinking & Reasoning, Social & Civic Responsibility, Systems Thinking

Materials

- labquest with carbon dioxide sensor
- plastic bag
- rubber bands
- access to numerous cars of different makes, models, and years

Background for Teachers

Carbon dioxide is one of the main by-products of the internal combustion engine in addition to water vapor. There are also many other compounds in car exhaust that are produced by impurities. Carbon dioxide is an important component of our atmosphere as a greenhouse gas that keeps the temperature on our planet at a level that is habitable for humans, plants, and Animals. However, human caused activities have put a large surplus of carbon dioxide into the atmosphere since industrialism and atmospheric carbon dioxide concentration will likely be at double their normal levels before the end of the century.
For this lesson you will need to construct an instrument to collect exhaust from a car tailpipe and test the carbon dioxide levels. A plastic bag with a hole cut in it for the carbon dioxide probe and held by rubber bands works well.

Student Prior Knowledge

Students should understand that carbon dioxide is a natural part of our atmosphere and that it is produced from combustion. Knowledge of the chemical changes that take place during combustion, as well as understanding of the greenhouse effect may be helpful, but are not necessary.

Intended Learning Outcomes

Students will:

- understand that carbon dioxide is one of the main components of car exhaust.
- practice asking scientific questions.
- practice using the scientific method to create an experiment that answers their scientific question.
- learn to use the labquest probe to take data and practice proper sampling procedure.

Instructional Procedures

Day 1:

- Ask the students what they know about car exhaust? What is in it? Do we want to breath it?

What do they know about carbon dioxide?
Introduce the labquest and temperature probe. Include how to use the probe and what units carbon dioxide is measured in. Measure the carbon dioxide concentration in the classroom.
Take students outside in medium size groups and demonstrate the use of the probes to measure the carbon dioxide in car exhaust. Also take a measurement of the carbon dioxide concentration outside the school.
Discuss what your different measurements were.

Day 2-3:

Have students brainstorm variables they could test between different cars (year, make, model, etc.). You may need to limit their choices depending on what cars you have available to test.
Guide student in setting up their experiment following the scientific method. This can be done using a scaffold or a different way. If students are more advanced they may be able to do this on their own.
Once students have completed their design, check their procedure to ensure that it will answer their scientific question.

Day 3-4:

Check students procedures and go over sampling protocol again.
Take groups out one at a time to collect their data. (This will likely take more than one class period to collect all the data, so plan to have other activities for the students that are not collecting data.)
Have students record, plot, and analyze their data. Compare date between groups.
Have students draw conclusions about their experiment. Did they answer their question? What would they do differently next time?

Extensions

If time permits students could:

discuss how increasing carbon dioxide in our atmosphere impact our environment.
calculate how much carbon dioxide is released when parents or buses idle while dropping off or picking up students.
plan a no-idling campaign and implement it at their school.
teach others about human impact on their school environment.

Rubrics

Science Lab Report Rubric

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