



Quarrybrook

EXPERIENTIAL EDUCATION CENTER

Program Title: **Particle Pollution**

Audience: 6th-8th grade students

Program Theme: Some atmospheric particles can be a health risk for humans and it is important to know where they come from, how to prevent them, and how we can track their occurrence. Students will get to know these concepts while measuring particle pollution at Quarrybrook, and will also complete a project to measure particle pollution back at their school or homes.

Program Goals: Students will understand that there is particulate matter in the atmosphere at all times. Students will know that fine particles can be harmful to human health, and that many of these particles can be of human origin. While at Quarrybrook, students will monitor particulates in the air and graph their findings. Students will test a hypothesis by making particle collectors to bring to their school or homes, where they can be monitored for additional data.

Next Generation/Common Core Connections:

Topic: MS-ESS3 Earth and Human Activity

Dimensions: Analyzing and Interpreting Data, Patterns

Program Outline:

Activity 1: INCOMPLETE COMBUSTION (15 min.) – Students will observe incomplete and complete combustion by conducting an investigation using a candle and a tin can.



Teachers and other adults will be helpful in keeping students focused and on task during the demonstrations.

Objective: Students will learn how incomplete combustion affects particle formation.

Intended Outcomes: Students will have observed incomplete and complete combustion. Through discussion, students will describe their differences and how that affects the atmosphere.

Activity 2: PARTICLE PROTECTORS! (15 min.) – Students will model cilia within the lungs to demonstrate the relationship between the particle size of atmospheric pollutants and a body's ability to filter them out.



Teachers and other adults will be helpful by participating in the simulation!

Objectives: Students will know how lungs filter particles that are breathed in. Students will be able to explain that small pollution particles are harder to filter than large pollution particles.

Intended Outcomes: Students will have modeled cilia trapping and deflecting particles, to prevent them from entering the lungs. Students will be able to describe how smaller-sized particles can be more of a problem for humans.

Activity 3: PARTICLE COLLECTION HIKE and ANALYSIS LAB (60 min.) – Students will hike the Quarrybrook property, gathering several particle collectors hung in advance of the program. Students will count the particles they can see by eye, by hand lens, and by microscope. Students will log descriptions of what has been collected.



Teachers and other adults will be helpful in keeping students focused and on task while working with their groups on the trail and also during the lab activity.

Objectives: Students will test their hypotheses of what types of particles would be found at the Quarrybrook site. Students will use scientific tools to observe and count the particles collected.

Intended Outcomes: Students will have used hand lenses and microscopes to view particles. Students will have completed a data log to determine particle size. Students will graph results and analyze the data from each location to determine particle size disbursement around the Quarrybrook property.

Activity 4: PARTICLE COLLECTOR CONSTRUCTION (30 min.) – As time allows, students will assemble particle collectors to take back to their school or homes, to measure particle pollution at another site.



Teachers will be given the collecting material (packing tape or Vaseline) to be applied when particle collectors are placed at the second monitoring site. Teachers will coordinate the data collection and analysis from the second site.

Objectives: Students will fabricate a particle collector for their school or homes. Students will hypothesize the type and amount of particles expected to be collected at their second location.

Intended Outcomes: Students will have made their own particle collector, to take with them to measure particle pollution at another site. Students will have written hypotheses for the type and amount of particles expected to be collected.

Conclusion/Wrap-up: (5 min.) After completing the particle collectors, we will review by discussing the observations the students made regarding particulate matter. We will review incomplete and complete combustion, and how our lungs filter out some of the particles that we breathe in.

Successful completion of this program will help support your students' proficiency in NGSS

Performance Expectations:

MS-ESS3-3 Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.