Children's Environmental Literacy Foundation

CASE STUDY: CELF CIVIC SCIENCE

Comprehensive Model School Project (CMSP), NYC

Students Explore issues of Environmental Justice and Develop Solutions for their Community

CELF's Civic Science Program is made possible in part with the support of the National Geographic Society, Linde PLC, & the San Diego Foundation.

CMSP school building in the Mott Haven section of the Bronx. NY.

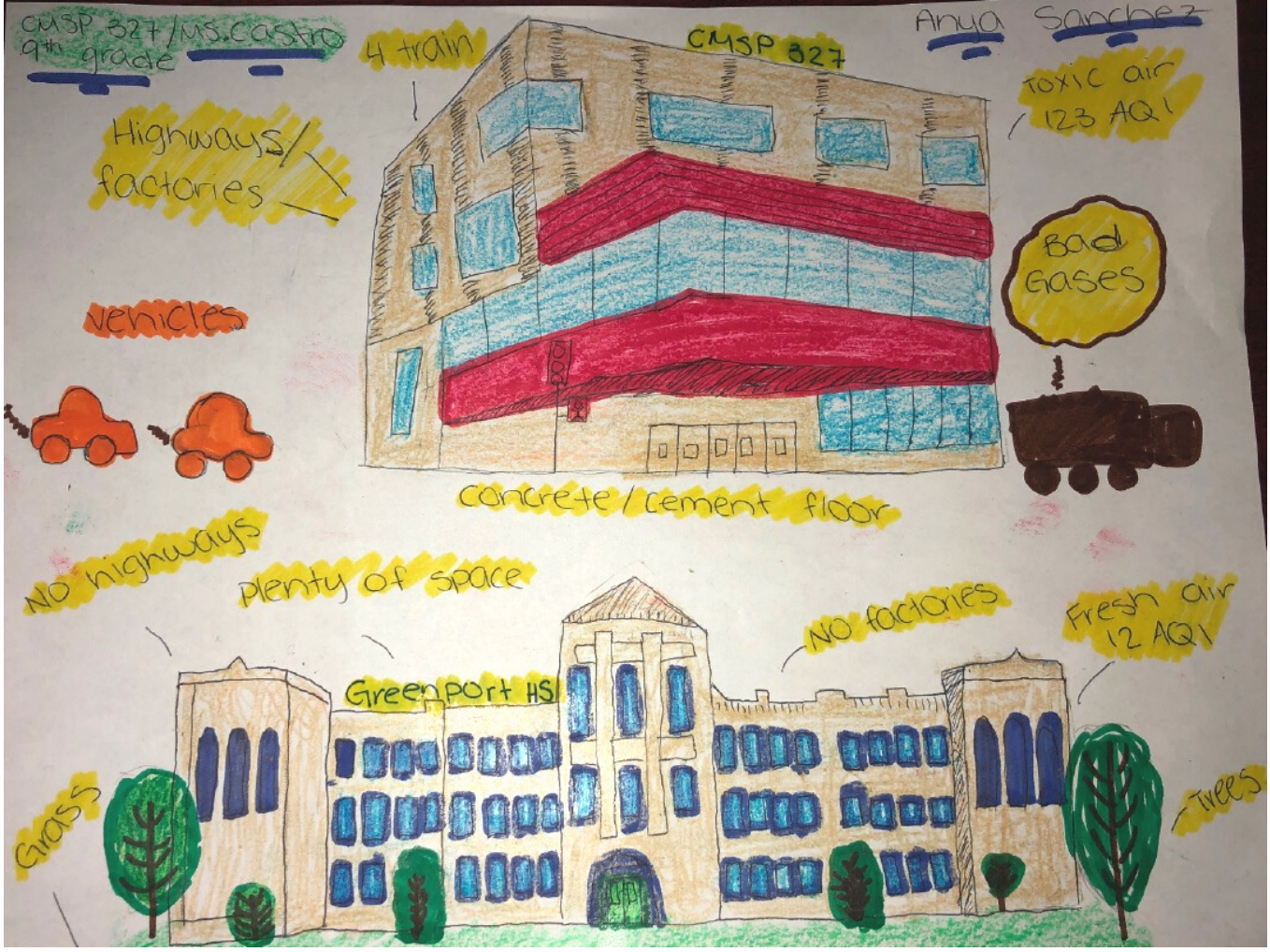
BACKGROUND

Carolina Castro is an Earth Science teacher at the Comprehensive Model School Project (CMSP), a public school for grades 6-12 in the Bronx and a participant in CELF's Civic Science Spring 2021 program. "I signed up for CELF's Civic Science course to build an authentic STEM program at my school. Many of my students do not see STEM careers as a possible pathway for their future and are missing out on valuable future career opportunities. Providing my students equitable access to STEM opportunities that involve authentic problems that affect our community is the primary reason I signed up for this program. CELF's Civic Science program was an opportunity to introduce my students to the importance of air quality in our school neighborhood."

The Mott Haven neighborhood where the school is located is often referred to as "Asthma Alley." The hospitalization rates are ***five times higher than the national average*** and ***twenty one times higher than other NYC neighborhoods***. Ms. Castro started teaching 19 years ago after working in a laboratory for a cosmetic company. "I have always enjoyed learning and had many valuable experiences as a student at DeWitt Clinton High School in their STEM program. These experiences led me to pursue science as a career option. After 9/11, I decided that it was time to pursue a new path that was more meaningful. A good friend suggested I would make a good teacher. With my background, I was placed in a STEM teaching program and was hired to teach science in my former high school."

NYC Department of Education

The Comprehensive Model School Project opened its doors in 2003 as a middle school. The school expanded to include high school in 2012 when it moved to the New Settlement Community Campus, a modern community center with a swimming pool, dance studio and rooftop garden. As part of New York City's Community Schools Initiative, CMSP receives extra funding for attendance improvement and drop out prevention. The school day is an hour longer, allowing for additional time in reading and math, and teachers pitch in on Saturdays to help students who need extra support. The school believes that academic success is a collaborative effort involving students, parents, teachers and other school staff who create engaging learning experiences within an atmosphere of social equity.



Student artwork contrasts the CMSP Bronx campus to a high school in Greenport, Long Island.

BACKGROUND (CONTINUED)

Ms. Castro found support from her colleagues, some of whom were her former teachers, and learned quickly that collaboration in and outside of the school is essential not only for learning, but as a means to network with various organizations, institutions of higher education and businesses. “I wanted to be the type of teacher that would motivate students to look at careers in STEM as viable opportunities by exposing them to learning experiences that were not only engaging, but relevant and meaningful in their lives.”

From taking yearly trips to test the water quality of the Hudson River, to conferences with scientists discussing topics like harmful pesticides in food, or the rising sea level concerns in the Bronx area, Ms. Castro has learned that teaching science through community issues provides unique opportunities to promote stewardship in environmental issues that can drive students to become science advocates.

Mrs. Castro felt that CELF’s Civic Science program, “aligns with my teaching philosophy that learning needs to be relevant and connected to my students in order to be successful."

"I have had allergies related to asthma and eczema my entire teaching career. While teaching remotely from Greenport, I had no asthma or eczema issues. Many of my students have asthma themselves and sharing this information opened the floor for some great dialogue and allowed students to comfortably share their stories and make connections with why this research is so important..”

Carolina Castro

Air Quality Civic Science at CMSP

During spring semester 2021, Ms. Castro's high school Earth Science students were learning remotely due to Covid-19. Ms. Castro introduced them to the study of air quality, its chemical composition and relationship to human and environmental health. They began by comparing data that Ms. Castro collected using the Plume Lab's Flow Air Monitor. Using the device, Ms. Castro collected data including levels of PM2.5 and other pollutants that determine the Air Quality Index (AQI) from school neighborhoods located in the South Bronx and near Greenport High School located on the North Fork of Long Island. Since it was the height of the COVID pandemic, Ms. Castro collected data during the afternoons or on weekends when students were not present. "I was working remotely from Greenport throughout last year. I had many of my Zoom classes outside and my students would often ask me to take them on a virtual tour of the area since it is by the water and surrounded by protected land. Since Greenport HS is centrally located and has about the same number of students as CMSP, I thought it would serve as a good comparison and provide control data."

Since Ms. Castro has taught in schools in and around the South Bronx for the last 19 years, she wondered if the air quality in these neighborhoods was contributing to her asthma and eczema. "I have had allergies related to asthma and eczema my entire teaching career. While teaching remotely from Greenport, I had no asthma or eczema issues. Many of my students have asthma themselves and sharing this information opened the floor for some great dialogue and allowed students to comfortably share their stories and make connections with why this research is so important."

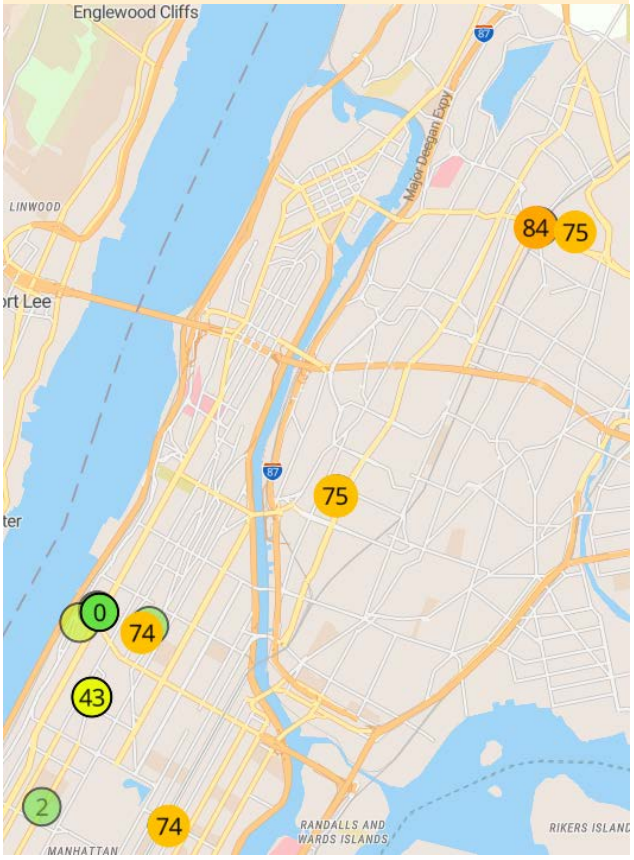
Ms. Castro used the CELF project implementation planner as a laboratory template. This planner helps teachers organize a project around a six-step *Inquiry to Action* process. She used various learning platforms, like Jamboard and Nearpod, to display the data for students, and placed students into breakout groups to analyze data and draw conclusions based on their understanding of the collected information.

"Students in breakout sessions not only analyzed and discussed our findings, they researched the history of asthma rates in our community discovering that we are part of a region in NYC referred to as Asthma Alley." Then students brainstormed ideas on how to tackle air pollution in the community.

Student-driven collaborative research

Students had questions on how best to collect the air sample data in order to draw a valid conclusion from our collected results. Other questions and ideas students came up with included:

- Sampling around the school at multiple spots throughout the day.
- Collecting air quality data over the course of 2-3 consecutive years in order to rule out irregular data created by unusual driving patterns caused by Covid.
- Measuring air quality on weekdays and comparing it to weekends when there is less traffic around our school and most businesses are closed.



Readings show relatively poor air quality in the Bronx.

Air Quality Civic Science at CMSP (CONTINUED)

The local, real-world aspect of the project was a great opportunity for students to see relevance in science research, hone their analytical skills and dive deeper into a problem.

Ms. Castro introduced the topic of air quality in the school community by having her students research the connection between its location: surrounded by multiple highways, businesses that burn fossil fuels and a lack of green space. “Even though many of the students were aware that the air quality around our school was poor, they were stunned at the high level of pollution in the data collected, some of the data showed air pollution levels as high as the most polluted areas in the world."

Applying CELF's Inquiry process, Ms. Castro asked students to create posters representing their findings. "I asked them to visualize what they see walking to school. Most of my students recall the massive amount of traffic and the auto body shops on every corner. A stark difference from the images I showed them of Greenport HS.”

The students read about Robert Moses and the purposeful building of expressways through their neighborhood. Their newfound understanding of social injustice and environmental racism led to productive dialogue and brainstorming on solutions.

Through the creation of art, students were able to express a deep understanding of the challenges facing their community. Their art projects "literally illustrate how engaged the students became in air quality and environmental justice."

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Carolina Castro

Data collection and representation

This year's Civic Science program was supported by grants from the National Geographic Society and from Linde, PLC. Grant outcomes related, in part, to performance indicators used by Ms. Castro, including:

- Understanding how air quality is measured through variables like the air quality index (AQI)
- Inferring from collected data the relationship between higher AQI values and poor air quality
- Work collaboratively to propose viable solutions to address the problem of poor air quality in and around their school community

These metrics demonstrated that the project was a successful and engaging learning experience.

As the class explored air quality in the community they wanted to know what they could do with the information. "We explored solutions to improve the air quality around our school and came up with the idea to make this project an ongoing activity in our school as part of an after-school STEM program."

"We invited our school administrators and community center leaders to the CELF Virtual Symposium and presented our proposal for school and community support for our Environmental Science program for the 2021-22 school year."

Carolina Castro

STUDENTS MAKE A DIFFERENCE

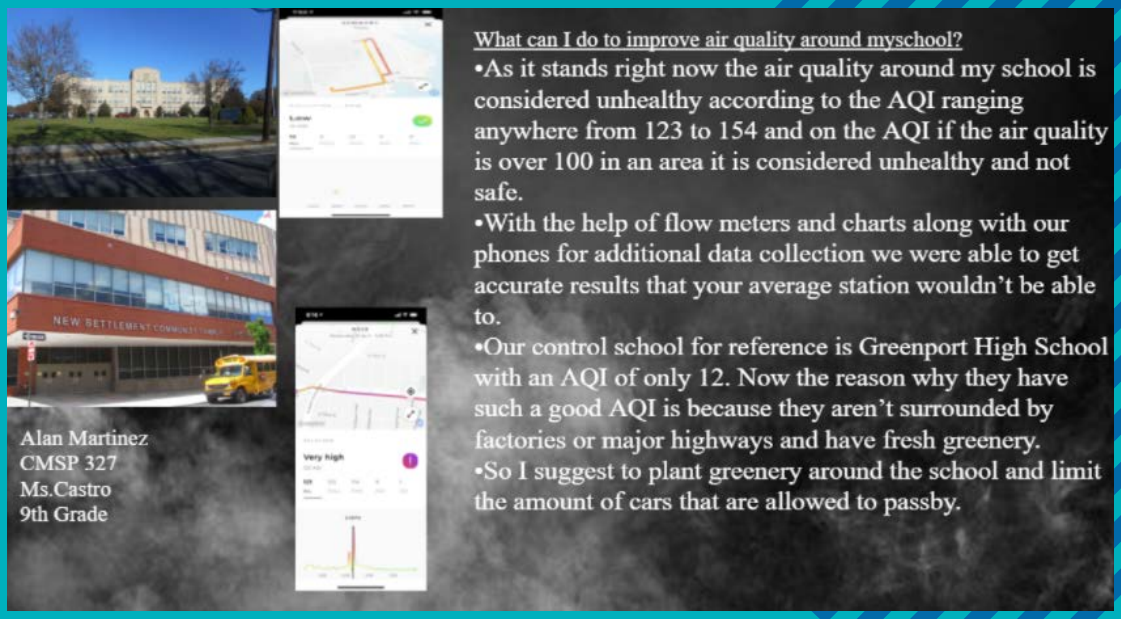
By the end of the project, all of Mrs. Castro's Earth Science students completed an analysis of the air quality data collected. They looked at the industries surrounding their school and drew connections between the poor air quality around CMSP High School and surrounding traffic congestion and a lack of green space.

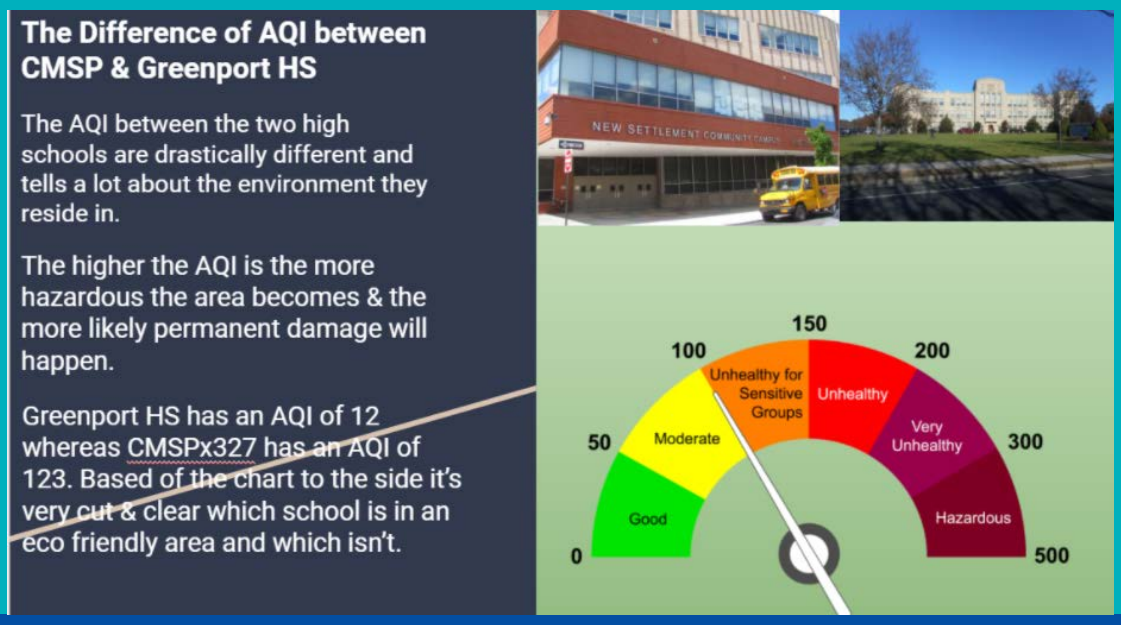
To help make a difference in both their school and community, Ms. Castro and her students came up with four project outcomes:

- Approach the School Community Center Leaders to request funding to purchase additional Flow air quality monitors to collect further data during the 2021-22 school year
- Create an Environmental Science After-School Program at both the school and community center that will address neighborhood issues like air quality
- Create additional greenspace at the school that will help to improve the air quality
- Speak to local politicians about limiting the number of vehicles that are moving around our school or have engines idling

Ms. Castro and her students also invited school administrators and community center leaders to CELF's Virtual Symposium where her students presented their findings to the NYC Department of Health, Plume Labs, and peers from schools across the country.

STUDENT SLIDESHOWS





THE LEARNING CONTINUES...

Ms. Castro is currently working with school administration and the school's Community Center to start an Environmental Science Club during the Spring Semester of the 2021-22 school year.

They are working together to fund the purchase of Flow air quality monitors to allow students to continue collecting data and further their air quality study.

"Students that participated in my class and presented at the CELF Symposium are recruiting new students by sharing their experiences and acting as mentors. My students and I plan to implement new science initiatives in the school including an after school Environmental Science program that will continue to monitor the air quality surrounding our school. Students will propose solutions on how to improve conditions to our local school and community leaders. Since COVID, more people are driving in cars and we have noticed that traffic congestion is at an all time high. We realize that it is important that we continue to monitor the air quality in and around our school and devise some solutions to the increasing problem of air pollution."