

Kids Making Sense®



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for

National Air Quality Conference
Austin, Texas

January 25, 2018

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Outline

- What Is Kids Making Sense?
- Why Kids Making Sense?
- Kids Making Sense History
- Successful Implementations
- Package Options
- Future Plans



What Is Kids Making Sense?

Kids Making Sense – An educational program to teach youth how to measure pollution using air quality sensors and to interpret the data they collect.



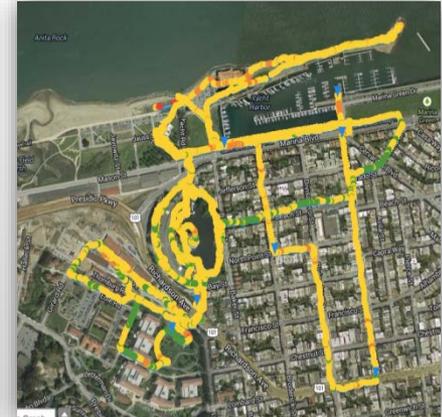
Learn



Measure



Discover



Interpret

2. Community Air Monitoring

- Example: California Air Resources Board AB617
 - Enhanced community-level air monitoring
 - Emphasis on community participation
 - Statewide strategy to reduce emissions, especially for disproportionately impacted communities
- Air districts are in a position to educate communities about small sensor capabilities and limitations



3. Curriculum for STEM education applications

- Provides an opportunity to engage middle and high school students with a hands-on STEM experience
- Helps students be a part of solving air pollution problems in their community

Standards

Kids Making Sense addresses many of the standards for Common Core and the NGSS as listed below.

Middle School NGSS

- MS-ESS2-5 Collect data to provide evidence for how air masses result in changes in weather systems
- MS-ESS3-3 Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment
- MS-ESS3-4 Construct an argument supported by evidence for how increases in human population and per capita consumption of natural resources impact Earth's systems.
- MS-ESS3-5 Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century
- MS-PS4-2 Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials
- MS-PS4-3 Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals

Middle School Common Core ELA Standards

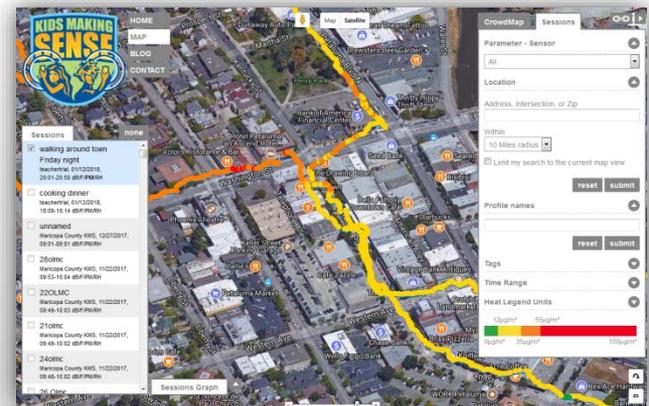
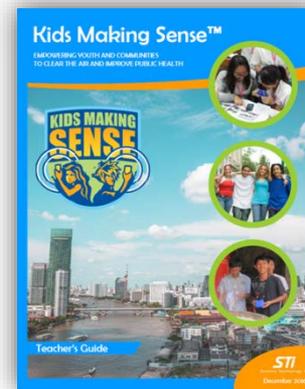
- CCSS.ELA-LITERACY.RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts
- CCSS.ELA-LITERACY.RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks
- CCSS.ELA-LITERACY.RST.6-8.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics
- CCSS.ELA-LITERACY.RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table)
- CCSS.ELA-LITERACY.RST.6-8.8 Distinguish among facts, reasoned judgment based on research findings, and speculation in a text
- CCSS.ELA-LITERACY.RST.6-8.9 Compare and contrast the information gained from experiments.

NGSS = Next Generation Science Standards

CCSS ELA = Common Core Science Standards English Language Arts

Components of KMS

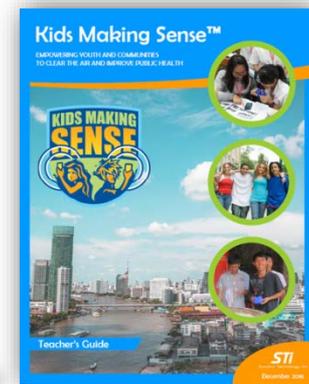
- Training materials
 - Student Workbook (soon to be K-12)
 - Teacher's Guide
 - Labs and experiments
 - Aligned with STEM
- Small sensors
- Website
 - Data exploration
 - Online resources



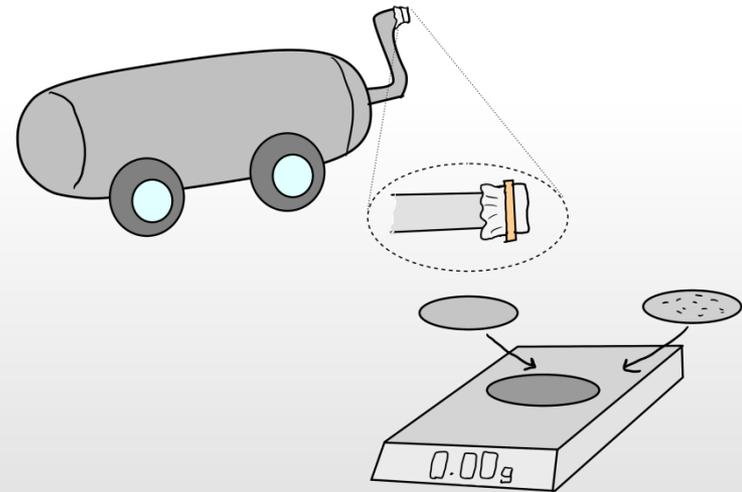
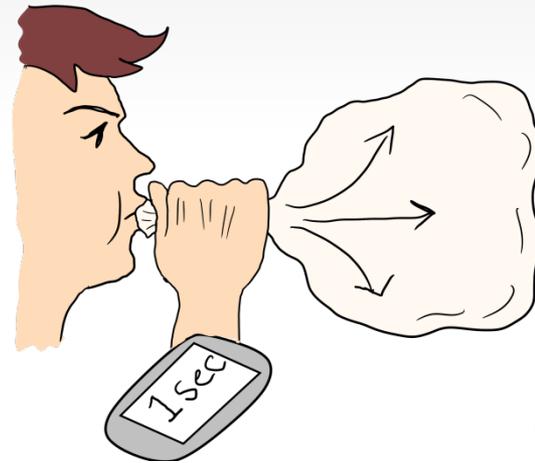
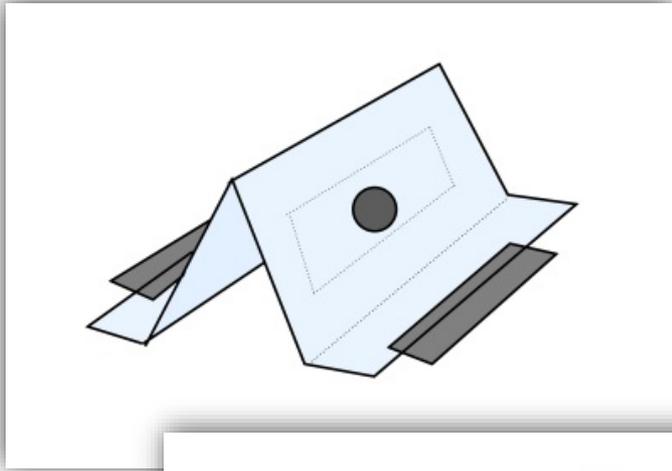
Teacher's Guide

- Each chapter has
 - Pre-Lab Guiding Questions, Potential Sources of Error, Cautions and Adjustments
 - Materials Needed and Time Required
 - Introduction, Procedure, Data, Observations, Calculations, Making Sense of Your Results, Going Further, On a Personal Note
 - Post-Lab Discussion
- Full program takes 10 50-minute class periods
 - There are recommendations for what to cover if you have 2, 4, or 6 hours of class time

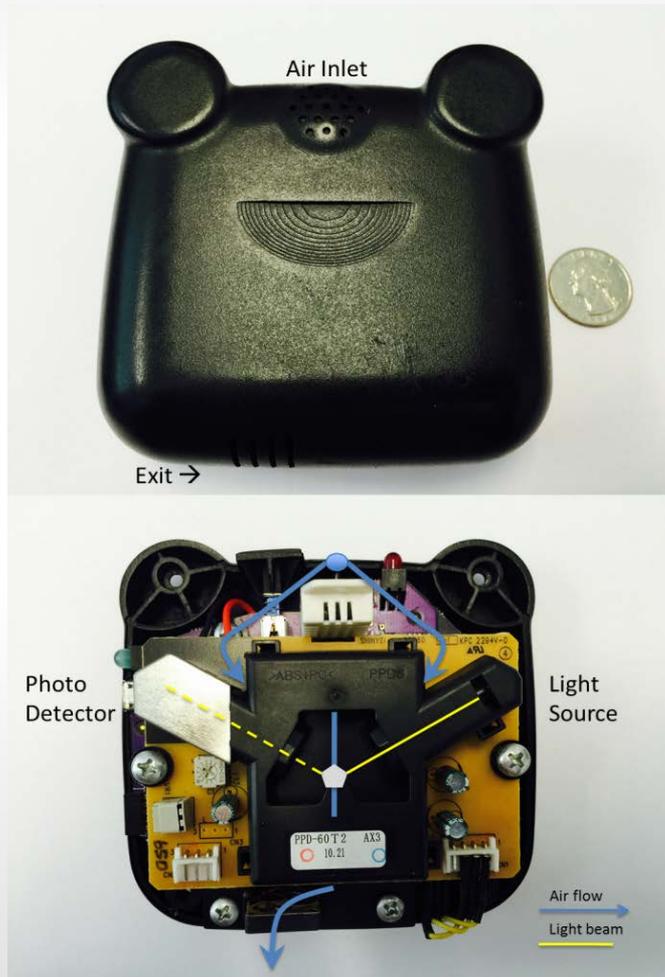
Kids Making Sense Kits



Labs and Experiments



The AirBeam Sensor



Known Issues

Light sensitivity

Does not work at high humidity (greater than 90%)

Upper detection limit (between 300 and 400 $\mu\text{g}/\text{m}^3$)

Sensor lifetime and reliability unknown

Sensor maintenance unknown

Website

KIDS MAKING SENSE

HOME
MAP
BLOG
CONTACT

Map Satellite

Parameter - Sensor
Sound Level - Phone Microphone

Location
Address, Intersection, or Zip
show

Profile names
reset submit

Tags
Time Range
CrowdMap Resolution
Heat Legend Units

60dB 80dB
20dB 70dB 100dB

Map data ©2018 Google, INEGI Terms of Use

Website

The screenshot displays the Kids Making Sense website interface. On the left, a navigation menu includes links for HOME, ABOUT, MAPS, BLOG, and DONATE. Below the menu is a 'Sessions' list with various entries, including 'Nelson's boarding trip.' which is selected. The main area features a satellite map with a yellow and orange path representing air quality data. A 'Sessions Graph' at the bottom shows a line graph of particulate matter levels over time, with a callout for a specific session: '02/20/2015 17:39:42-17:39:44 Particulate Matter = 59 µg/m³'. On the right, a control panel allows users to select a parameter (Particulate Matter-AirBeam), location, profile names, tags, time range, and heat legend units. The heat legend shows a color scale from 0 to 150 µg/m³.

Chat with a Scientist

- Provide opportunity for students to talk directly with an air quality expert
 - Answer questions about air pollution, pollutant sources
 - Discuss study design, controls, findings
 - Describe how we became scientists
- Provide teacher support

Typical 1-Day KMS Workshop

- Half-day lecture/training on air quality concepts
 - Sources of pollution
 - Particle sizes
 - Health effects
- Half-day air pollution measurements
 - Hands-on activity using handheld air sensors
 - Discover pollution sources and cleaner areas
 - Data collected by students sent to a website
 - Guided discussion and data interpretation



KMS History

- Six-year history with over a dozen pilots and projects
- Support and involvement from EPA's Office of Environmental Education and air districts (e.g., Sacramento AQMD and Maricopa County AQ Department)
- Several international workshops (Taiwan, Thailand, and South Korea)
- Started in classrooms and expanded to air district training
- New community education kits based on feedback



Successful Implementations

- Maricopa County, AZ
 - Two-day training for educators and air agency outreach personnel
 - Curriculum customizations by Maricopa staff to meet AZ standards
- Dana Middle School, San Pedro, CA
- John North High School, Riverside, CA
- Bay Area Air Quality Management District, San Francisco, CA
 - Staff training on KMS kit
 - Set up public lending library



Standard Package Options

Classroom Package

Sensors, supplies, and support for multiple classes of 10-35 students.

- 10 air sensors, 10 mobile phones, and access to the KMS data-viewing website
- Teacher's Guide and Student Workbook[©]
- In-person teacher training workshop
- Google Hangouts with an air quality scientist
- Phone support

Small Group Package

Sensors, supplies, and support for groups of 5-20 students.

- 5 air sensors, 5 mobile phones, and access to the KMS data-viewing website
- Teacher's Guide and Student Workbook[©]
- In-person teacher training workshop
- Google Hangouts with an air quality scientist
- Phone support



Real science. Real fun.

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New Options

Classroom Package

Sensors, supplies, and support for multiple classes of 10-35 students.

- 10 air sensors, 10 mobile phones, and access to the KMS data-viewing website
- Teacher's Guide and Student Workbook[©]
- In-person teacher training workshop
- Google Hangouts with an air quality scientist
- Phone support

Small Group Package

Sensors, supplies, and support for groups of 5-20 students.

- 5 air sensors, 5 mobile phones, and access to the KMS data-viewing website
- Teacher's Guide and Student Workbook[©]
- In-person teacher training workshop
- Google Hangouts with an air quality scientist
- Phone support

Air Quality Action Kit

Sensors, supplies, and support for 3-15 students at a time.

- 3 air sensors, 3 mobile phones, and access to the KMS data-viewing website
- Teacher's Guide and Student Workbook[©]
- Phone support

Citizen Scientist Kit

A single kit that can be shared and reused.

- 1 air sensor, 1 mobile phone, and access to the KMS data-viewing website
- Citizen Scientist Curriculum[©]
- Phone support

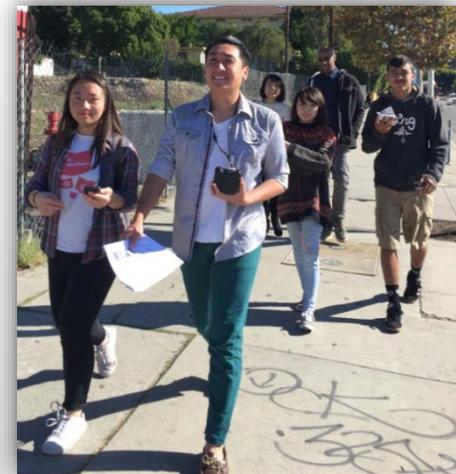
Backyard Kit

A complete air quality and weather sensor kit.

- 1 hand-held air sensor, 1 stationary air sensor, 1 outdoor weather station, 1 mobile phone, and access to the KMS data-viewing website
- Teacher's Guide and Student Workbook[©]
- Phone support

Benefits of Kids Making Sense

- Increases awareness of air pollution exposure within communities
- Empowers youth to drive positive change during a time when they are forming their own transportation and consumption habits
- Provides students and community groups with opportunities to interact with air quality scientists
- Includes information on recommended actions and interactions with policymakers
- Helps build capacity among air district staff



The Future

- **New sensors** – AirBeam2, PurpleAir, other?
- **New parameters** – gases such as ozone, meteorology
- **New lessons** – meteorology
- **Expanded reach** – K through 6
- **Additional teaching approaches** – Maricopa County updates
- **More collaborators**

Contact Us



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