

LOW-COST PERSONAL AIR SENSORS

An FAQ for Valley Schools



Low-cost personal air sensors are increasingly popular, and can provide unique benefits to the public despite their inability to offer regulatory-quality air pollution data. This FAQ provides an overview of low-cost sensors with the aim of empowering schools to better understand the kinds of information they provide, and to make informed decisions about their use.

What do low-cost personal air sensors measure?

There are a wide variety of sensors now sold by many manufacturers. They come in different shapes and sizes, use different technologies, and measure different pollutants, such as particulate matter, ozone, or NO₂. Unlike the Valley Air District's monitors, they are very inexpensive (\$250 compared to tens of thousands of dollars), and are not required by law to be accurate.

How accurate are they?

More research is needed. Based on studies conducted by EPA, the Association of Air Pollution Control Agencies (AAPCA), the San Joaquin Valley Air Pollution Control District, the University of Utah, and other public institutions, accuracy can vary widely and should not be assumed. Some sensors may overestimate pollution as air quality worsens¹, and many respond unexpectedly to factors like temperature or humidity². Sensors that have been collocated alongside government monitors and have had correcting algorithms developed may be more reliable than others. However, because low-cost sensors are unregulated, and each company's methods of quality assurance are rarely made public, many questions surrounding their longevity and quality control remain. As a result, their data may or may not truly reflect local conditions and does "drift", or diminish in accuracy, over time (EPA estimates 1-2 years in most cases³).

How can schools benefit from low-cost personal air sensors?

Although low-cost sensors cannot provide regulatory-quality data, they do contribute different data. Comparing their data to data from regulatory sources (which are required by federal law to be regularly calibrated and maintained according to strict standards) is an important step in better understanding their benefits and limitations. Students and teachers can participate directly in this effort while learning about the science of air pollution for little cost. Educators can use an increasing number of available educational resources to demonstrate the need to think critically about data, and to show how the scientific method applies to real-world emergent technology.

Where can I find more information?

EPA offers an Air Sensor Toolbox (www.epa.gov/air-sensor-toolbox), and the AAPCA offers a useful fact sheet (<https://www.cleanairact.org/documents/AAPCAPersonalAirSensorFactSheet6-21-2017.pdf>). The Valley Air District continues to evaluate the performance of a variety of low-cost sensors through our TEST program, posting the results for the public at www.valleyair.org/aqmonitoring/test. The District welcomes questions and comments by phone at (559) 230-6000, or email at healthyairlivingschools@valleyair.org.

¹ "Update on District's Low-Cost Air Monitoring Sensor Action Plan" (presentation, The San Joaquin Valley Air Pollution Control District's Governing Board Study Session, Bass Lake, CA, September 20, 2018). http://www.valleyair.org/Board_meetings/GB/agenda_minutes/Agenda/2018/September/presentations/15.pdf

² George M. Woodall et al., "Interpreting Mobile and Handheld Air Sensor Readings in Relation to Air Quality Standards and Health Effect Reference Values: Tackling the Challenges," *Atmosphere* 8.10 (2017): 182, doi:10.3390/atmos8100182

³ Ron Williams et al., "Sensor Evaluation Report," U.S. Environmental Protection Agency, Washington, DC (2014): 83, EPA/600/R-14/143 (NTIS PB2015-100611)