

Institute for Tribal Environmental Professionals Environmental Education Outreach Program



Research Education on Air and Cardiovascular Health (REACH)



Environmental Education Outreach Program EEOP



- Project Director
- Chemical Engineer
- Classroom Teacher



EEOP Mission Statement



The vision and mission of the EEOP staff is to foster life-changing learning experiences in the application of science, mathematics, technology and engineering to local issues that empower American Indian students of all ages to become self-determinate citizens of their sovereign tribal nation.

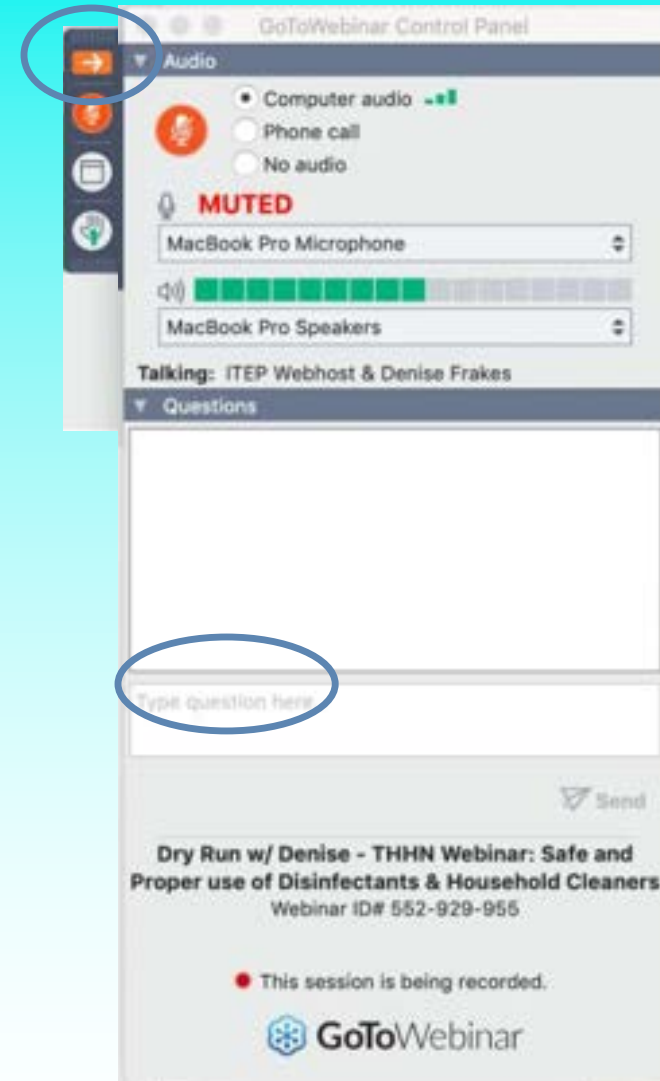
REACH



- Citizen/Community Science for K12
- Inquiry-based air quality curriculum modules
 - Research methods design
 - Focus on environmental health

Control Panel

If your webinar control panel on the upper right side of your screen is minimized, you can click on the orange arrow on the grab tab **to access the audio and questions box.**



Webinar Logistics

- Webinar is being recorded
 - URL for the recording will be in post-webinar email
- Questions
 - Use the Question box to submit questions any time
 - You can also email mansel.nelson@nau.edu
- Please complete the webinar feedback survey
 - URL for the feedback will be in post-webinar email
- Certificates will be included in the post-webinar email

Program Materials

<http://health.umt.edu/reach/default.php>

Download application form



Mansel A. Nelson

Project Director

Environmental Education Outreach Program (EEOP)

Northern Arizona University (NAU)

nau.edu/eeop/

mansel.nelson@nau.edu

Voice 928 221 1222

FAX 928 286 8882

PO Box 5768, Flagstaff, AZ 86011



[**www.nau.edu/eeop**](http://www.nau.edu/eeop)

Tony Ward



Professor and Chair of the
School of Public and
Community Health Sciences
University of Montana

Working with schools and
rural communities and
schools in Montana, Idaho,
Alaska, and Arizona on air
pollution.

Brett Taylor



High School science teacher
for 35 years

Education Coordinator in
the REACH (Research
Education on Air and
Cardiovascular Health)

Overview of the Research Education on Air & Cardiovascular Health (REACH) Program

September 22, 2020



Missoula, Montana



Missoula, Montana



Photo by Todd Goodrich



Photo by Todd Goodrich



[pinterest.com](https://www.pinterest.com)

Today's presentation

- Overview of the REACH program.
- Potential opportunities to form new partnerships between ITEP, the University of Montana, and tribes / schools.

What is REACH?

- Research Education on Air & Cardiovascular Health (REACH) Program
- An education/outreach program that works with middle and high school students in rural areas of Montana, Alaska, Hawaii, and Idaho.
- Engages students through research projects focused on indoor air pollution (PM_{2.5}), cardiovascular health, and population health (interventions).

Alphabet soup

- REACH: Research Education on Air & Cardiovascular Health
- NIH: National Institutes of Health
- SEPA: Science Education Partnership Award
- PM2.5: Particulate matter (the small stuff...)

Time for a history
lesson...

Air Toxics Under the Big Sky

- The program began with 16 students at Big Sky High School (Missoula, MT) during the 2003/2004 school year.

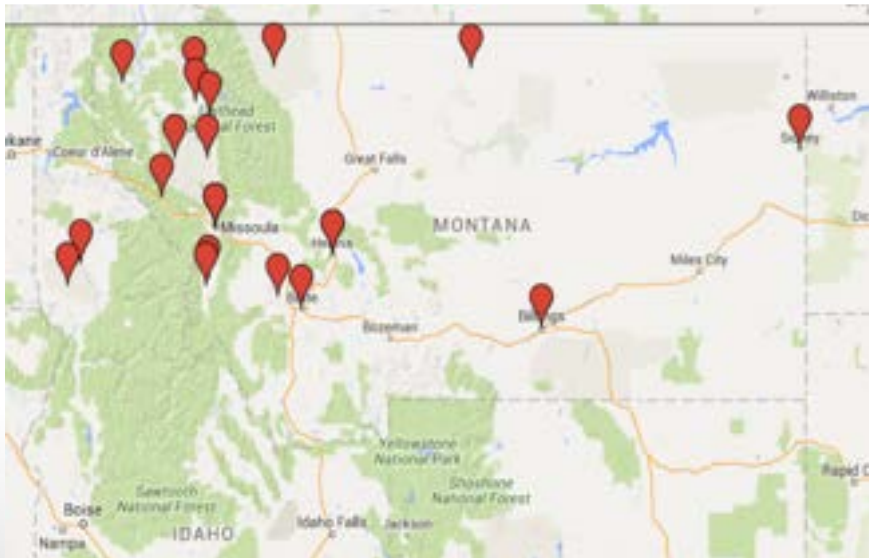


NIH SEPA funding

- SEPA I (2005-2012): Air Toxics Under the Big Sky
- SEPA II (2012-2018): Clean Air and Healthy Homes Program, CAHHP

Focus on rural, underserved communities

- CAHHP engaged over 10,000 students located throughout rural areas of Montana, Idaho, and Alaska.
- We developed a network of teachers and schools (both middle and high schools) in various subject areas including chemistry, biology, environmental science, physical science, and anatomy/physiology.



What we provided to classrooms:

1. Exposure to research related to air pollution (CO, radon, and PM_{2.5}) and respiratory health.
2. Access to air quality testing equipment.
3. Forums for presenting student research.
 - Annual symposium at U of M.



UM Field Trips



What we provided to teachers:

1. Air quality and respiratory health curriculum.
 - Radon, CO, and PM: Aligned to state standards and NGSS.
2. Teacher Workshops (Professional Development).
3. Access to UM researchers.



Then came SEPA III...

- Improving Rural Population Health through Air Quality and Cardiovascular Health Education
- Sept 1, 2018 – July, 31, 2023.



So what's different with REACH?

- Students will still be doing research related to indoor and outdoor PM_{2.5}, but there is a new focus on cardiovascular health and population health (as well as *research*).



Other components of REACH

- Students will also have new opportunities to engage in activities related to citizen science, science communication, and mentoring.
- Teachers will be provided curriculum and have opportunities for professional development.

Overall Goals

- NIH: Encourage young people to seek further education and careers in environmental, biomedical, and public health sciences.
- Our experience is that our program educates students in rural, underserved areas about air quality and health, including ways they can reduce exposures within their homes, schools, and communities.

Where we work



By the end of the 2019/2020 school year, we were working with 954 students, in 44 classrooms, and 20 schools throughout rural areas of Alaska, Idaho, and Montana.

There are four primary “Aims”
of REACH

Aim 1: Citizen Science

Develop authentic research experiences using novel PM_{2.5} monitors with a new focus on cardiovascular and population health.

- Develop and implement new inquiry-based curriculum modules focused on 1) research methods design, 2) cardiovascular health, and 3) population health.
- Incorporate novel PM_{2.5} air sampling technologies into the program.

REACH equipment to support student research

- Students participating in the REACH program will have access to the following equipment:
- PM_{2.5} monitors that measure indoor, outdoor, and personal PM_{2.5} concentrations.



Aim 2: Science Communication

Build student skills, confidence, and interest in science by providing opportunities for students to translate their research findings to different audiences.

- Students will design and deliver presentations about their REACH research and experiences in one or more of the following settings:
 1. Classroom/school presentations
 2. Community events
 3. The annual REACH Symposium
 4. State science fairs

Aim 3: Student Mentoring

Provide engagement and mentoring activities that support student research and expose students to careers in basic and clinical medical research.

- Through a virtual research support platform for REACH students, we will provide feedback and coaching to students as they design and implement their research studies.
- Create job shadow and internship opportunities.

Aim 4: Teacher Professional Development

Provide multiple learning opportunities for teachers and pre-service teachers in order to facilitate their understanding of biomedical concepts and their successful implementation of the REACH program with students.

- Summer workshops.
- Ongoing teacher contact events throughout the school year.
- Teacher resources page on the website.

Timeline of REACH activities

Sequence of events within the classroom

- **Aug:** Teacher workshop.
- **Oct/Nov:** Introductory air quality lesson within the school.
- **Oct/Nov:** Schools are provided with air samplers, along with training.
- **Nov – Apr:** Students design and complete their air quality research projects.
- **May:** Students present findings at a culminating event.

Aug: Teacher workshop

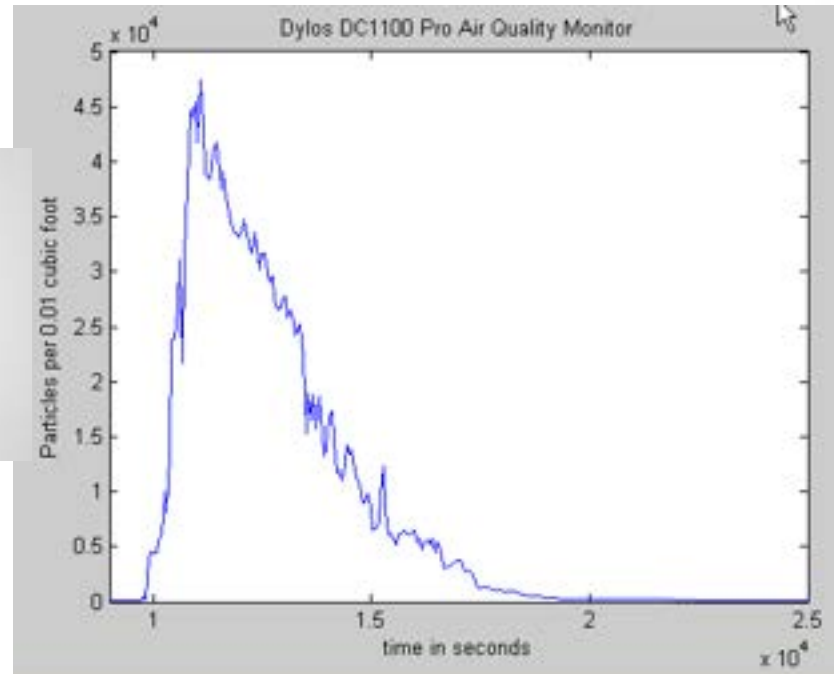


Oct/Nov: Intro presentation



Oct/Nov: Air samplers and trainings

- Air sampling equipment are provided to the classrooms to measure indoor air within students' homes, schools, etc.



Nov – Apr: Student research projects

- Students work in groups or by themselves.
- Topics have typically focused on air quality issues related to indoor particulate matter (PM_{2.5}).

Examples

- The Impact of Wood Stoves on Indoor Air Quality
- Which Meat is the Worst to Cook?
- The Effect of Cigars vs. Cigarettes on our Air Quality
- How Does Altitude and Weather Impact PM_{2.5}?



Univ Montana Symposium (~May 17)



Poster sessions



Remote Symposia (rural Alaska)



Other culminating events

- Regional symposia (schools in a common region).
- Parent nights.
- Presentations at local health fairs and health boards.



Formal Evaluation Results

- Independent evaluator Dr. Michael Coe.
- Pre- and post-program evaluations are given to students.
- Our evaluation results provide evidence supporting the effectiveness of REACH in developing students' research skills.
- *Participating students expressed an increased interest in science and pursuing a career in science.*

CAHHP Publications

- Adams, E., Ward, T., Vanek, D., Marra, N., Noonan, C., Smith, G., Jones, D., Henthorn, M., and Striebel, J., (2008). Air Toxics Under The Big Sky: A real-world investigation to engage high school science students. *Journal of Chemical Education*, 85(22), 221-224.
- Adams, E., Ward, T., Vanek, D., Marra, N., Hester, C., Knuth, R., Spangler, T., Jones, D., Henthorn, M., Hammill, B., Smith, P., Salisbury, R., Reckin, G., and Boulafentis, J., (2009). The Big Sky inside: measuring rural indoor air quality and its impact on the community. *The Science Teacher*, April/May, 40-45.
- Delaloye, N., Adams, E., Hester, C., Ware, D., Vanek, D., Holian, A., and Ward, T.J., (2016). The Clean Air and Healthy Homes Program: A model for authentic science learning. *Science Education and Civic Engagement*, 8(2), summer 2016.
- Delaloye, N., Blank, L., Ware, D., Hester, C., Ward, T., Holian, A., and Adams, E., (2017). Evaluating the impact of authentic research on secondary student self-efficacy and future scientific possible selves, *International Journal of Environmental and Science Education*, in press.
- Jones, D., Ward, T., Vanek, D., Marra, N., Noonan, C., Smith, G., and Adams, E., (2007). Air Toxics Under The Big Sky -- A high school science teaching tool. *Science Education & Civic Engagement: An International Journal*, 1(2), 51-55.
- Marra et al., 2011; Marra, N., Vanek, D., Hester, C., Holian, A., Ward, T., Adams, E., and Knuth, R., (2011). Evolution of the Air Toxics Under the Big Sky program. *Journal of Chemical Education*, 88(4), 397– 401.
- Vanek, D., Marra, N., Hester, C., Ware, D. Holian, A., Ward, T., Knuth, R., and Adams, E., (2011). The power of the symposium – impacts from students' perspectives. *The Rural Educator*, Spring 2011, 20-26.
- Ward, T., Vanek, D., Marra, N., Holian, A., Adams, E., Jones, D., and Knuth R., (2008). The Big Sky Model: A regional collaboration for participatory research on environmental health in the rural West. *Journal of Higher Education Outreach & Engagement*, 12(3), 103-115.
- Ward, T., Delaloye, N., Adams, E., Ware, D., Vanek, D., Knuth, R., Hester, C., Marra, N., and Holian, A., (2016). Air Toxics Under the Big Sky: Examining the effectiveness of authentic scientific research on high school students' science skills and interest. *International Journal of Science Education*, 38(6), 905–921.

Final thoughts for teachers

- The REACH program has a focus on working with students in rural and underserved areas.
- We offer a tool kit – you pick what you want to do.
- Students will have access to novel air sampling equipment to conduct research on projects of their choosing.
- Curriculum has been developed by teachers for teachers.
- This program is a partnership.



Thank you.

Tony Ward

(406) 243-4092

Tony.Ward@umontana.edu

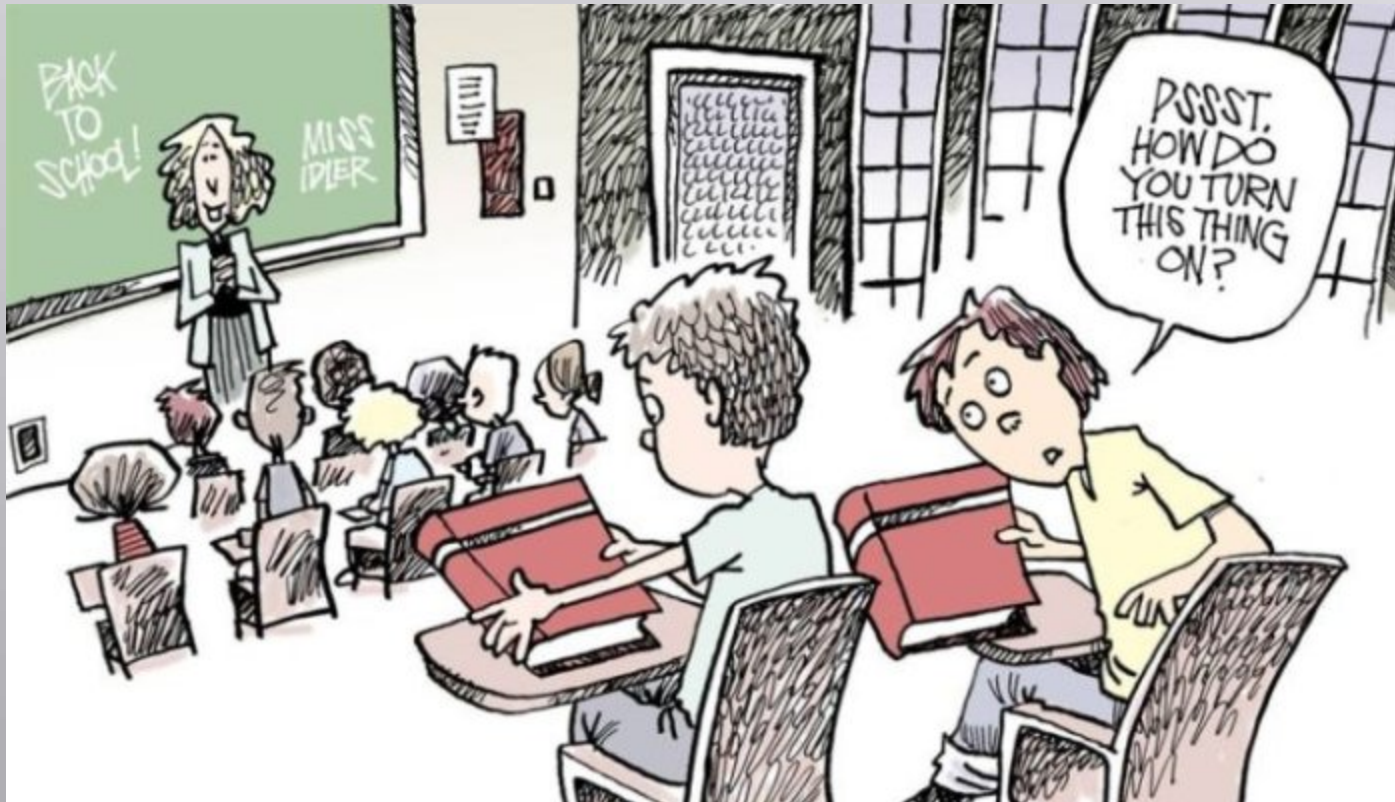
HOW CAN THE REACH PROGRAM HELP TO INCORPORATE INQUIRY & RESEARCH CURRICULUM ACTIVITIES INTO THE SCIENCE CLASSROOM?



Brett Taylor

Education Coordinator, University Of Montana School of Public and Community Health Sciences
ITEP/REACH Air Quality Education Webinar: September 22, 2020

Plans For Student Involvement:



Classroom Curriculum Activities:

- Guided Inquiry Based (the 5 e's): one of the closest learning strategies to doing actual science.
- Focus will be on environmental and population health, and economic impacts of substandard air quality.
- Activities will include science, math, and engineering components (STEM).



Classroom Curriculum Activities:

- ❑ How is population health affected by particulate air pollution?
- ❑ How does particulate air pollution affect the cardiovascular system?
- ❑ How do you design a successful research project?

Existing Lessons on the REACH Website

☐ **Particulate Matter, PM:**

1. Where does particulate matter come from?
2. What are the health risks of exposure to particulate matter?

☐ **Carbon Monoxide:**

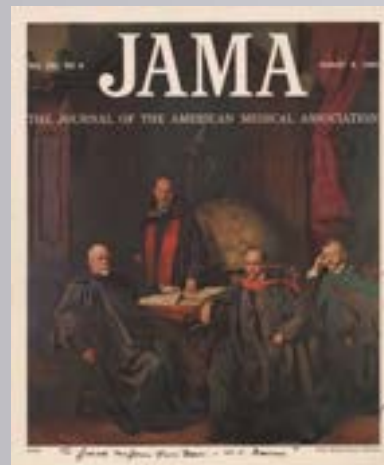
1. What is complete and incomplete combustion?
2. What are the health effects of carbon monoxide exposure?

☐ **Radon:**

1. What is radioactivity?
2. What is radon?
3. What are the potential health effects of exposure to radon gas?

Current Air Quality Research with Study Guides

Available beginning Fall 2020, the REACH Program will provide current articles from journals and periodicals about air quality and public health issues related to air quality. Each article will have an accompanying study guide.



The student air quality research project is the primary focus of the REACH Program – learning science by doing science.



REACH Inquiry Lesson: How do you design a successful science research project?



Grade/ Grade Band: 9-12

Topic: Science research design and data analysis.

Lesson Number: 3 (in a series of 3 lessons)

Lesson Description: Science uses systematic processes to solve problems and answer questions about the natural world. Scientists may perform experiments, do modeling, or use field observations in order to figure out how the world works. However, most science classes do not provide students the opportunity to do authentic science. Instead, students learn about and verify the results of some other scientist's research. The primary focus of the REACH Program is to provide students that opportunity to conduct their own air quality-based experimental scientific investigation. The teacher, with assistance from the REACH team, guides students through the science associated with experimental research design using the Explore activity, *How do you design, conduct, and record the progress of your air quality science research project?* The lesson will generally require parts of 2-5 class periods but these are spread over the course of the academic year. The lessons are presented in pdf format and can be used as pencil and paper activities or they can be assigned and completed digitally. Adobe Acrobat Reader most efficiently facilitates the digital completion of the activity. If an important goal of science education is to produce "scientifically literate" citizens, then our students should have experience with one of the most important kinds of scientific learning.

Learning Targets:

Students will be able to:

- Develop a working definition of science.
- Summarize the processes associated with experiment-based scientific investigations.
- Design and conduct a rudimentary scientific investigation.

Inclusion of American Indian Content:

Society has profited greatly from research conducted by Native American scientists. One such scientist was **Fred Young** (aka Fred Begay). Young was a nuclear physicist and member of the Navajo Nation. In his youth, he was trained by the Bureau of Indian Affairs to become a farmer but never graduated from high school. However, after serving in the Korean War, he attended the University of New Mexico and earned a bachelor's degree in math and science and a Master's as well as a Ph.D in physics. His work was in the alternative use of lasers, electrons, and ion beams to heat thermonuclear plasmas for use as alternative energy sources. For more information on Dr. Young, see <http://bit.ly/DrFredYoung>.

Robbie Hood is an atmospheric scientist that works for the National Oceanic and Atmospheric Administration, NOAA. In September, 2008, she became the first permanent director of NOAA's Unmanned Aircraft Systems Program. She spent much of her childhood in Neosho, Missouri and Piquette, Mississippi, developing a fascination with weather when she witnessed the devastating effects of Hurricane Camille in 1969 and the 1974 Neosho tornado. Ms. Hood is a direct descendant of John Ross, the first elected chief of the Cherokee Nation. For more information on Robbie Hood, see <http://bit.ly/MsRobbieHood>.



Science uses *systematic processes* such as experiment, modeling, and field observations to answer questions and solve problems about the natural world.



Curriculum Support For Integrating Air Quality Science Research Into Your Science Curriculum

- Project Templates
- Timetable Suggestions
- Student Research Portal on Reach Website
- Access To Professional And Technical Assistance From The University Of Montana School Of Public and Community Health Sciences

Access To Air Quality Monitoring Equipment And Corresponding Tech Support

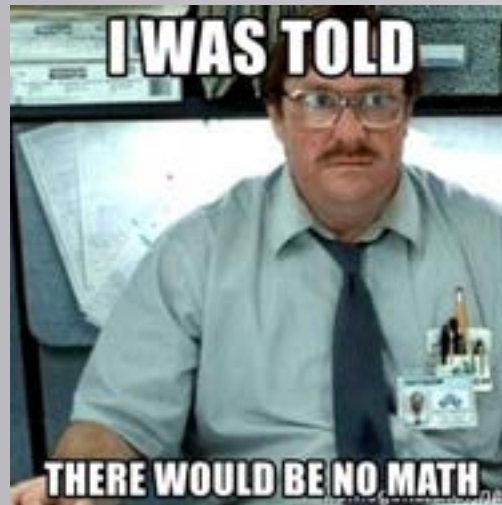
- Wynd Personal Air Quality Trackers & Air Purifiers
- Wynd Halo Air Quality Monitor
- Dylos Air Quality Monitors



What skills will students develop by conducting air quality research?

- ☐ Understanding science is a process, not a text book.
- ☐ Developing a relevant and specific research question.
- ☐ Predicting and hypothesizing.
- ☐ Designing and conducting an experiment.
- ☐ Analyzing data and drawing conclusions based on that data.
- ☐ Perseverance.
- ☐ Collaboration.
- ☐ Critical thinking skills.
- ☐ Communication.

Perseverance + **C**ritical
Thinking + **C**ollaboration +
Communication = **21st**
**Century Education (Independent
Learners)**



Research Education on Air and Cardiovascular Health (REACH)

Home About Student Research Teacher Resources Curriculum Equipment People Publications Contact



Home > Teacher Resources > School of Public and Community Health > REACH

REACH

What is REACH?

Children growing up in rural and medically underserved communities face unique challenges, and may not always have adequate access to educational opportunities that provide experience with cultivating biomedical knowledge and interests in scientific careers. With funding provided by a National Institute of Health Science Education Partnership Award (SEPA), we will work with schools located in rural and underserved Indian Health Service communities throughout Montana, Idaho, and Nevada to use the award to implement the REACH program, with a focus on PA, a cardiovascular and pulmonary health risk for successfully utilized in rural, underserved areas to increase middle/high student interest in careers in basic and clinical medical research.

Improving Rural Population Health through Air Quality and Cardiovascular Health Education



Funding Agency: Science Education Partnership Award (SEPA), National Institute of Health, National Institute of General Medical Sciences

Grant Number: 1 R01 GM128940-01A1

Principal Investigator:
 Ting Wang, PhD
 School of Public and Community Health Sciences
 University of Montana
 Phone: (406) 243-4002
TINGWANG@MONTANA.EDU

Specific Aims

Citizen Science	Science Communication	Student Mentoring	Teacher Professional Development
AIM 1	AIM 2	AIM 3	AIM 4

Contact Information:
 REACH
 601 East
 Education Building, Room 118
 Missoula, MT 59812
 Phone: (406) 243-4002
 Fax: (406) 243-4002
reaching@montana.edu

National Institute of Health Science Education Partnership Award



Reach Program Website:
<http://health.umt.edu/reach/>



Thank You For Your Attention!