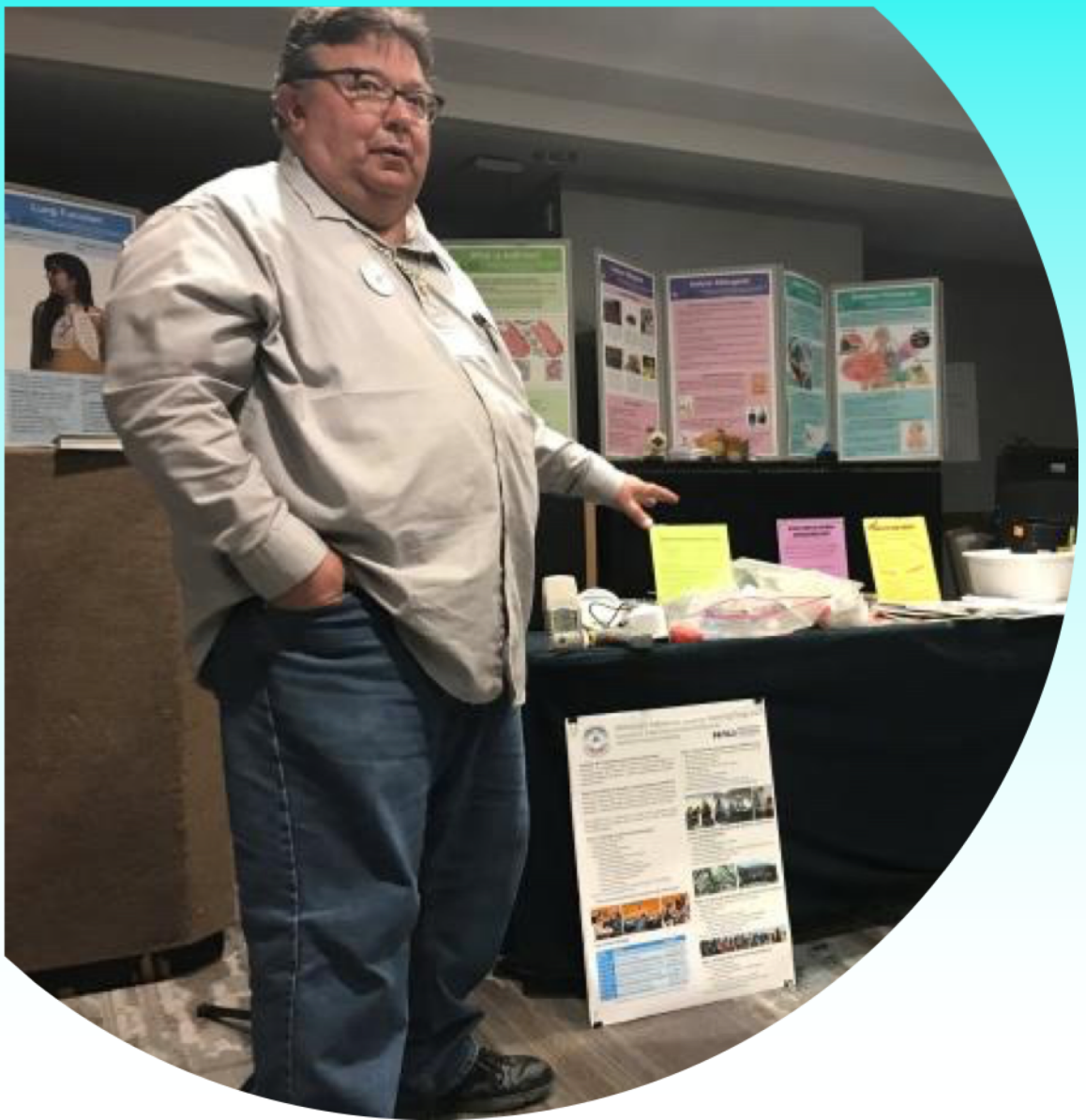
Institute for Tribal Environmental Professionals
Environmental Education Outreach Program

Research Education on Air and Cardiovascular Health (REACH)

Environmental Education Outreach Program

EEOP



- Project Director
- Chemical Engineer
- Classroom Teacher

Environmental Education Outreach Program

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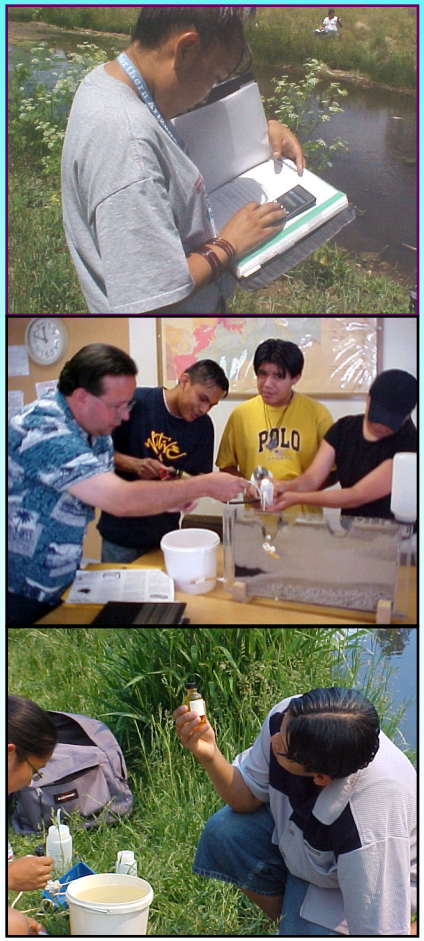
EEOP Mission Statement



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.

www.nau.edu/eeop

Environmental Education Outreach Program

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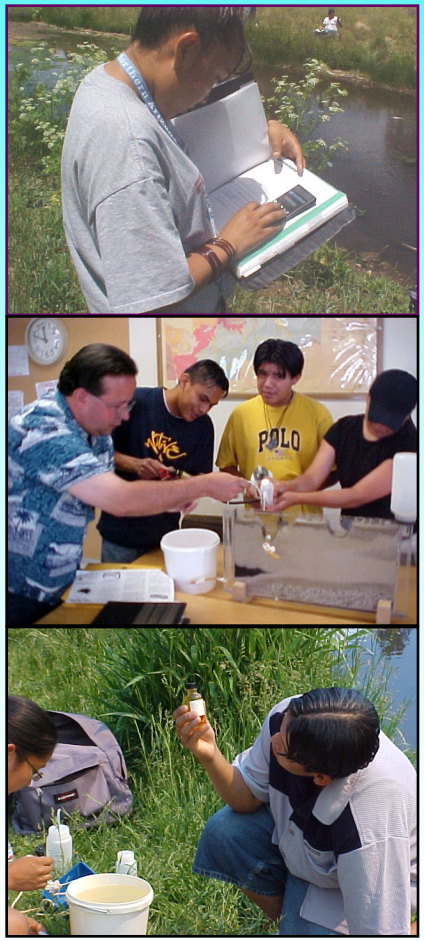
REACH



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

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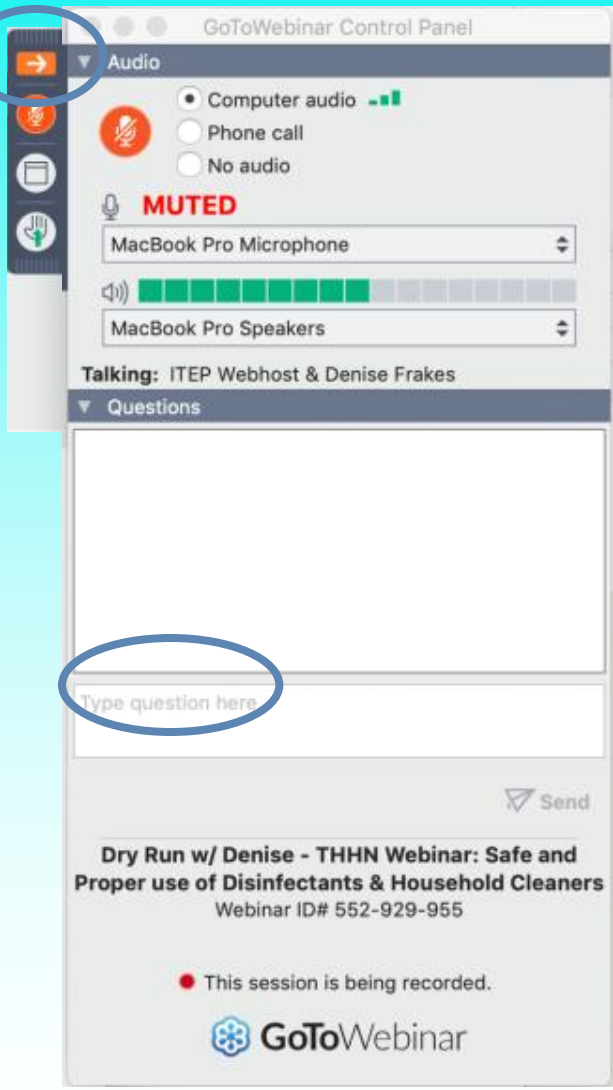

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Webinar Logistics

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Environmental Education Outreach Program

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Program Materials

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

Download application form

Environmental Education Outreach Program

EEOP

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Environmental Education Outreach Program

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Presenter

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.

Environmental Education Outreach Program

EEOP

Presenter

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

UNIVERSITY OF MONTANA
SCHOOL OF PUBLIC AND COMMUNITY HEALTH SCIENCES

Grant Number: 1 R25 GM129849-01A1

Missoula, Montana

Missoula, Montana

Photo by Todd Goodrich

Photo by Todd Goodrich

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).

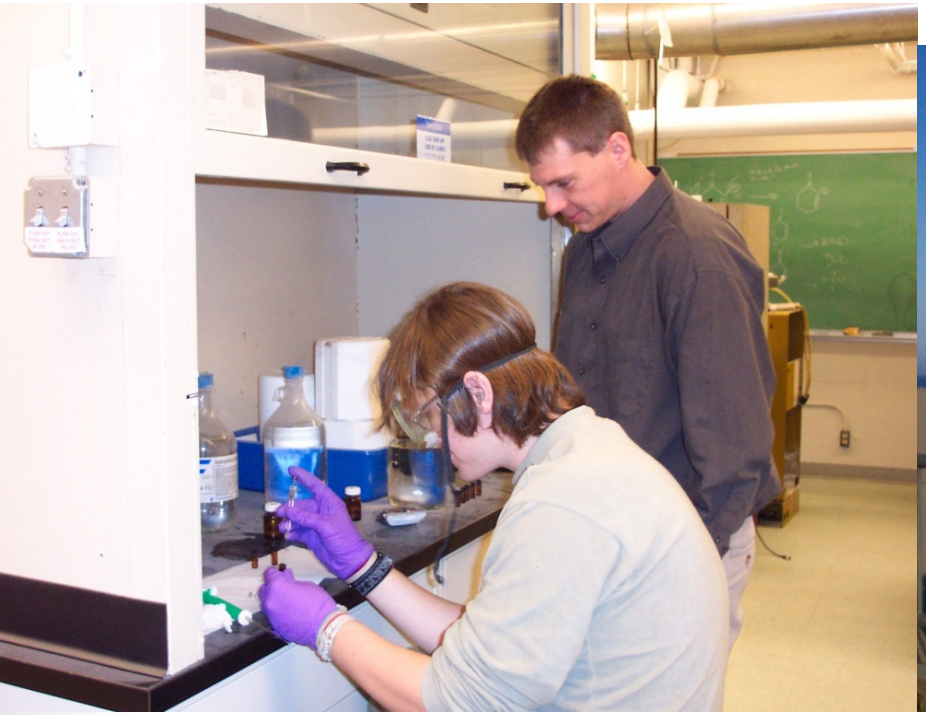
Alphabet soup

- 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.



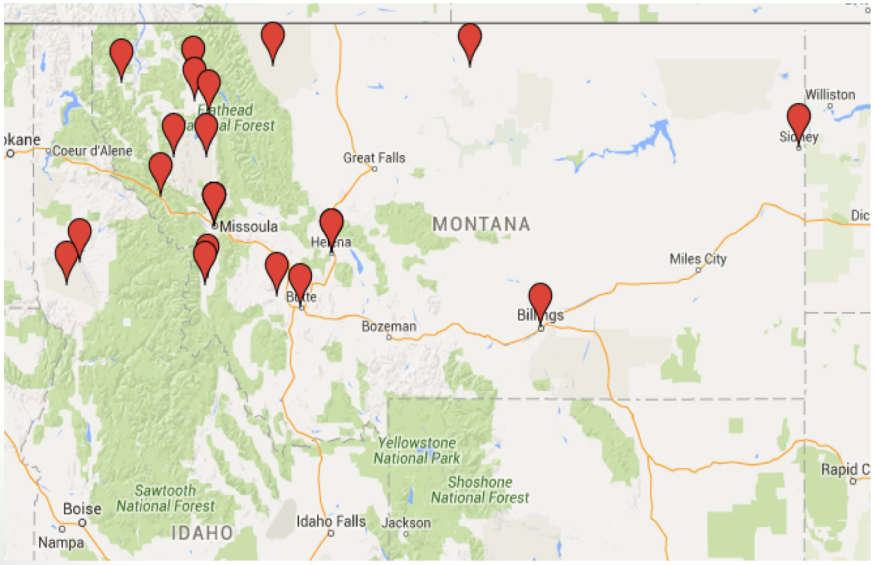
NIH SEPA funding

- 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.

REACH

RESEARCH EDUCATION ON AIR & CARDIOVASCULAR HEALTH

UNIVERSITY OF MONTANA, MISSOULA

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*).

https://health.umt.edu/reach/

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.

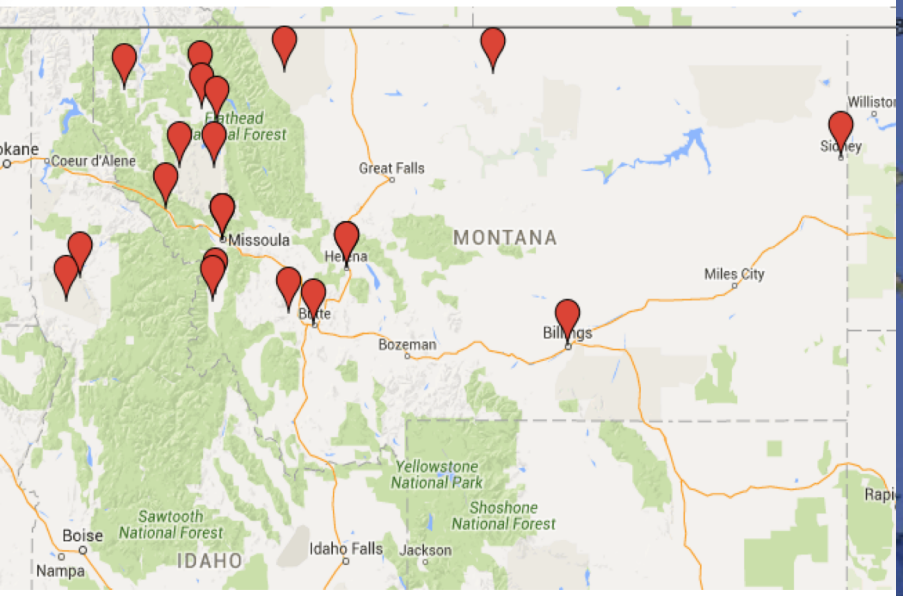
https://health.umt.edu/reach/

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

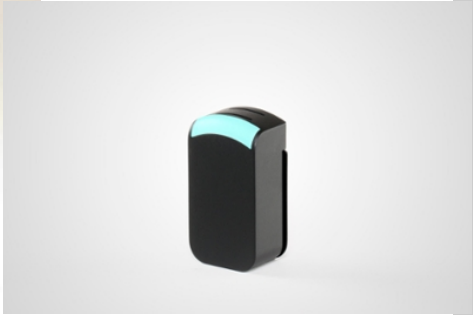
- **Aug:** Teacher workshop.
- **Oct/Nov:** Introductory air quality lesson within the school.
- **Oct/Nov:** Schools are provided with air samplers, along with training.
- **Nov – Apr:** Students design and complete their air quality research projects.
- **May:** Students present findings at a culminating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

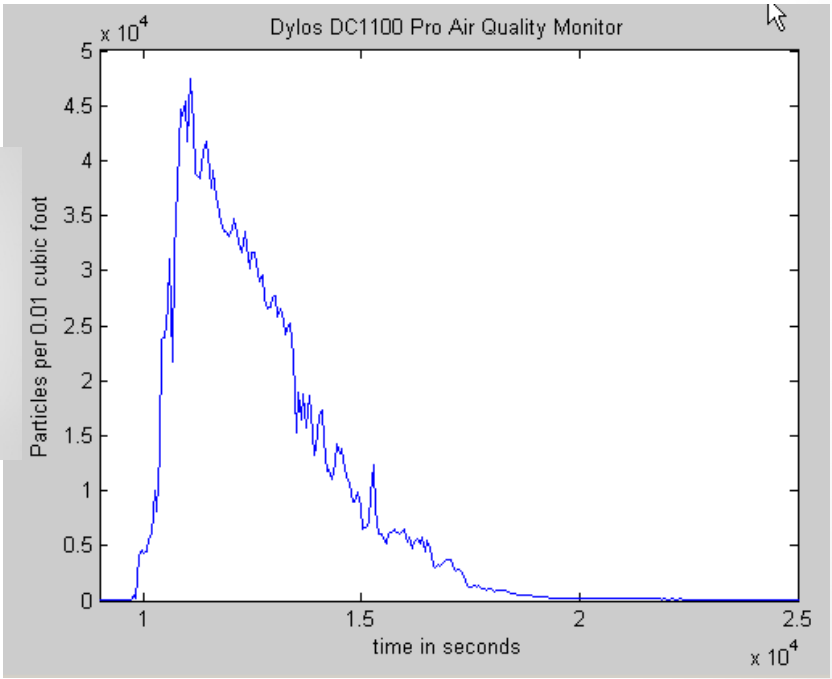
Aug: Teacher workshop

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 ($PM_{2.5}$).

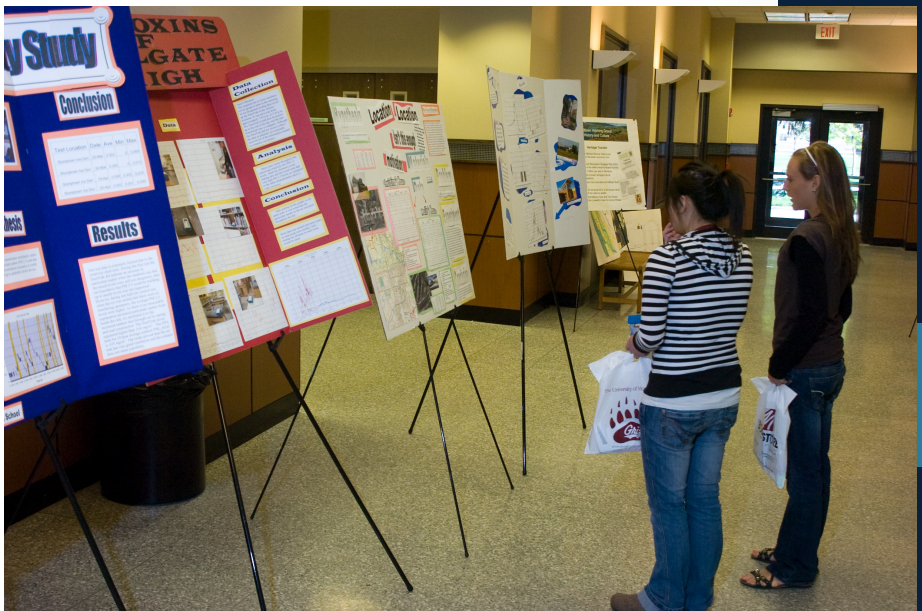
Examples

- 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 $PM_{2.5}$?

May: Culminating events

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
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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:

https://www.linkedin.com/pulse/case-student-involvement-planning-curriculum-strong-its-cusack-mpa

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

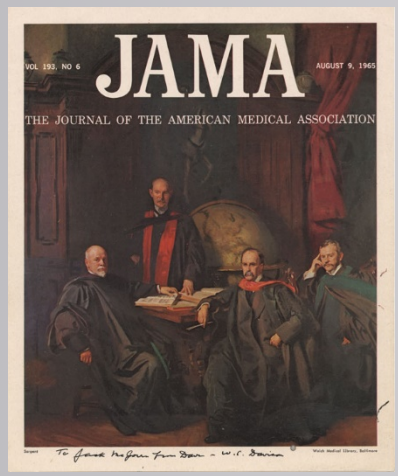
- **Particulate Matter**, PM:
  1. Where does particulate matter come from?
  2. What are the health risks of exposure to particulate matter?

- **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 Picayune, 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 descendent of John Ross, the first elected chief of the Cherokee Nation. For more information on Robbie Hood, see http://bit.ly/MsRobbieHood.

The REACH Program is funded by a National Institutes of Health Science Education Partnership Award.

SEPA SCIENCE EDUCATION PARTNERSHIP AWARD
Supported by the National Institutes of Health

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

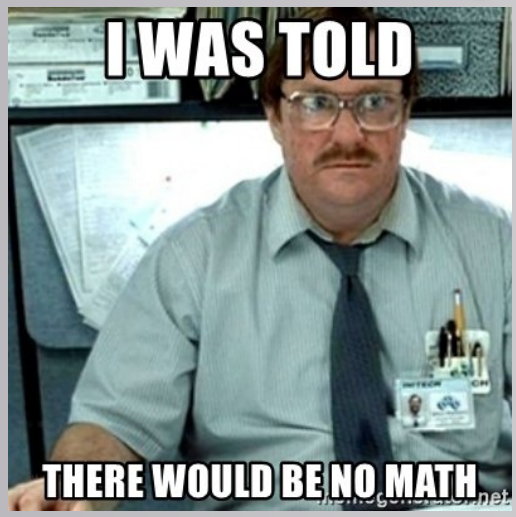
Access To Air Quality Monitoring Equipment And Corresponding Tech Support

- 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 + Critical Thinking + Collaboration + Communication = 21st Century Education (Independent Learners)



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Reach Program Website:

http://health.umt.edu/reach/

Thank You For Your Attention!