



## City of Fort Collins Education and Outreach Community Grant

### *Utilizing U-POD Technology to emphasize STEM in Poudre School District*

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*“Hands-on and learning by experience are powerful ideas, and we know that engaging students actively and thoughtfully in their studies pays off in better learning”*

Rutherford, 1993



## **Project Description**

The National Climate Assessment indicates now is the time for each community to urgently address greenhouse gas emissions caused by human actions. As Fort Collins expands its focus on reducing energy use and greenhouse gas emissions through a revised Climate Action Plan, and through participation in the Georgetown University Energy Prize competition, developing the energy literacy of students in the Poudre School District will become increasingly important for the Utilities Education Team. Our plan is to develop this literacy to include project-based learning utilizing hands-on technology with students and teachers.

If selected for an AirWaterGas Education and Outreach Community grant, Utilities would purchase two U-POD units to enable incorporation of technology to investigate air quality relating to greenhouse gas emissions. Up until this point the team has not been able to utilize technology to explore the connections between greenhouse gases and local emission sources.

This project has two components. The first will incorporate the U-POD technology into one of the 12 stations of our 6<sup>th</sup> and 8<sup>th</sup> grade energy labs. After an introduction to the U-POD and the technology utilized to record gasses in the air, students will collect data from inside and/or outside (such as in the car drop-off line) their school and analyze it using graphs provided by the program on a laptop we provide. Building on lessons learned, the second project component will expand the program into high schools in the fall of 2015, allowing students to check out U-PODs to investigate a particular air quality question in the City. The student's work will culminate in a "Climate Collaboration Day" where participating students will gather to share their research, data, and results.

In order to run the middle school energy labs and the high school check-out program, Utilities will host at least 4 high school teachers in August 2015 at Colorado State University's Pingree Park Campus for teacher's training. Upcoming summer training shall include climate and energy themed materials, opportunities to collaborate with experts from AWG, and training in use of the U-POD, experimental design, and data analysis.



The objectives of this program are for:

Students to:

- Participate in expanded, hands-on energy labs that include connections between burning fossil fuels and the production of greenhouse gasses that are measurable
- Understand principles of air quality measurement
- Use U-POD to collect air samples that are educationally useful
- Develop reasonable analysis of graphs from locally collected air samples

Teachers and Utilities Education Team to:

- Participate in professional development training to understand and use the U-POD for collecting data
- Develop and use U-POD related air quality curriculum and materials
- Become collaborative partners with their students and the community to collect air quality data

Timeline:

- February – May 2015: Program and initial curriculum design, purchase of the U-PODS, training of Utilities Team, teacher recruitment
- June 2015 – August 2015: Teacher training, AWG presentations, finalize curriculum, design assessments
- September 2015 – December 2015: Implementation of U-PODS in middle school labs, U-PODS available for check-out
- January – February 2016: High School Program, Climate Collaboration Day. Final program assessment.



## **Our Organization and Partners**

The City of Fort Collins, Colorado, is nationally recognized by various organizations and magazines as a best place to live, work and play. Sixty miles northwest of Denver, Fort Collins is home to Colorado State University with 27,000 students, several large high-tech employers, and leading businesses in the microbrew industry. The community has access to outdoor activities and local cultural amenities, and is renowned for its bike-friendly, small-town feel. Fort Collins has grown from a small agricultural community into a major employment and retail center for Northern Colorado with 150,000 residents. The City is a full-service municipal organization operating under a home rule, Council-Manager form of government.

Fort Collins Utilities, a public power utility, provides electricity and water service to 65,000 residential and commercial customers. As part of its mission to focus on sustainability leadership, Utilities employs a team of Education Specialists that offer natural resource classes and education for all ages. The Education Team structures youth programs to correlate with the curriculum taught at Poudre School District, with an enhanced focus on local water and energy resources. We provide and maintain all lab equipment and print individual handouts for the labs. In its 19 year history, the Education Team has built strong relationships with many teachers and administrators, and frequently collaborates with teachers to develop or tailor materials to fit their classroom needs.

Building on the strong collaborative partnership that has been established between the City of Fort Collins Utilities Education Team and Poudre School District, educators from Utilities will continue and expand our work with students through hands-on labs in the classroom. In the past we have worked with four middle schools in the community. We would expand this initially to include six or more of the ten PSD middle schools and at least four high school teachers.

## **Audience**

The intended audience for our program is middle school students (6<sup>th</sup> and 8<sup>th</sup> graders) and high school science and technology teachers in the Poudre School District. In the future, we hope to expand the energy lab program to offer it to high school students, particularly A.P. Environmental Science



classes. However, until then we will be offering the U-POD check-out program utilizing our connections with the high school teachers.

We will engage our audience first through the relationships established between Utilities and many of the middle and high schools in our 19 years offering watershed and energy education. We have a long working relationship with many teachers and principals in these schools, and can easily leverage our reputation for excellence to introduce new programming and technology into our current offerings. We will then expand the program to all middle and high schools in our service area through outreach to shared contacts that emphasizes our history providing age-appropriate, state standards-linked programs and labs.

Utilities Education participates in a Strategic Sustainability Team which connects Poudre School District, City and Utilities employees, Colorado State University, and local energy related non-profits. These meetings allow for partnerships to develop and strengthen between all three groups as well as provide a space to share ideas, reflect on the success of past sustainable endeavors, and plan new efforts. By attending and playing an active role on this team, the Utilities Education group has made many contacts which will be useful in reaching out to schools, including the district science coordinator (see support letter attached) and district energy manager.

The Utilities Education team has also offered annual teacher trainings for over a decade, providing professional development opportunities as well as resources for the classroom for K-12 teachers. The 2015 teacher training is the ideal place to provide background and curriculum connections with the introduction of the U-POD units for high school environmental science projects.

## **Outcomes and Evaluation**

The intended outcomes for our project are:

- To provide a hands-on, scientific, place-based learning experience to a minimum of 800-1000 6<sup>th</sup> and 8<sup>th</sup> graders



- To infuse technology into curriculum to include local energy sources and hands-on measurement of fossil fuel emissions
- To engage, educate, and connect with science and technology high school teachers to facilitate the U-POD check-out program
- To empower students to make decisions that will enable them to lead healthy, socially and environmentally conscious lives

We will evaluate the numerical component of our outcomes (a minimum of 800 students) with the use of student head counts in each class we teach and the inputting of this information into our Education database.

In order to evaluate our success in educating students about energy sources in Fort Collins, impacts of fossil fuel emissions, and the technology of how air quality is measured, we will implement a pre and post assessment survey to the students we teach. Surveys will be collected and analyzed for statistically significant differences in answers between the pre and post-surveys.

To evaluate our success with the high-school check-out program we will develop a pre and post survey for participating teachers and students.

In order to evaluate our success in empowering students to make decisions that will enable them to lead healthy, socially and environmentally conscious lives, we will ask each student to list three things they can do to use less energy and/or make a positive impact with energy in their home at the end of our lab. While empowerment is a qualitative measure that is difficult to attribute to any one program, the ability of the students to come up with ways they can use less energy or make a positive impact with energy in their home will at a minimum speak to the confidence they have regarding energy topics.

All collected data will inform the future of the program and identify areas for improvement.



## Budget

Description	Quantity	Amount
<b>U-POD</b>	2	\$2000
	<b>Total Funds Requested</b>	<b>\$2000</b>
In-Kind Contribution Description	Quantity	Amount
<b>Education Specialist</b>	160 hours	\$3520
<b>Part Time Education Specialist</b>	80 hours	\$1600
<b>Teacher Training at Pingree Park</b>	4@175	\$700
<b>Laptop for U-POD Energy Lab</b>	1	\$500
<b>Media and refreshments for Climate Collaboration Day</b>	2 hours	\$250
	<b>Total Matching Contribution</b>	<b>\$6750</b>

City of Fort Collins tax exempt number: 98-04502

## Resource Needs

We are excited to partner with AirWaterGas and utilize their network of environmental professionals. We consider it a critical component for success. We foresee three areas where partner resources would be required:

1. Training and education
  - a. Our Utilities Education Team will need training and education on how to appropriately collect air quality data, transfer it to the computer for viewing, and an understanding of how to analyze the data. In addition, we need an expert on air quality to inform the design of our curriculum.
2. Speaking events (at summer teacher training)



- a. As described above, we host a summer teachers' training that is the ideal venue for an AWG representative to present information on the U-POD and how it's been successfully used on projects such as the North Fork Valley Air Quality Monitoring Project. We would host this presentation in conjunction with the introduction to the energy lab program and the high-school data sharing program.
3. Ongoing support and troubleshooting
  - a. We foresee the need to have a regular connection with an AWG professional to assist our team with technology issues and troubleshooting. After the initial training and education, our team should be able to utilize the U-PODs as intended. However the large volume of students that will be using the U-POD will require ongoing maintenance of the units to ensure we're collecting accurate data.

## **Project Deliverables**

The project deliverables for our program proposal would be the state standards correlated lesson plans for our 6<sup>th</sup> and 8<sup>th</sup> grade energy labs, a list of the stations and materials we use at each, the process and details of our high-school check out program, and the template of our surveys and other evaluation tools.

The list of stations and materials, in combination with the lesson plan, would make it possible for other educators to recreate our lab. Whether they're a formal teacher in a classroom, or an informal educator such as the Utilities Education team providing programs and labs to multiple schools, our energy lab could be available for use.

A second project deliverable would be professional development workshop plans, materials for use with teachers to develop and practice skills in using the U-POD, design of the U-POD check-out program, data collection, and analysis.

Lastly, we would provide the instruments we used for evaluation and program assessment, including surveys, pre and post tests, and lessons learned.