Why take professional development STEM workshops at SMUD?

SMUD’s Energy Education & Technology Center offers a variety of STEM workshops for teachers. Our mission is to give teachers interesting, topical and sustainable projects which they can share with their students.

No one has taken this mission as seriously as San Juan Unified science teacher, Bonnie Marketti who teaches science at Dyer Kelley Elementary School (Grades 1-6). She has integrated solar activities into almost every grade level. With assistance from parents, Bonnie has encouraged her students to learn about circuitry and technology with cute Bristlebots, which are tiny little robots made from toothbrushes. Many of her classes have incorporated LED paper crafting as students learned about circuits. She even rewards well behaved students with dry ice party activities which she learned at the Spooky Science workshop.

Bonnie has demonstrated a partnership with SMUD can help her add many valuable tools to her toolbelt which inspires her students to learn and love science.

Bonnie will be back at SMUD this fall to learn more about LED crafting and coding projects. Come and join her and see how STEM activities can ignite your students.

(Pictured Dyer Kelley science students, Bonnie Marketti and projects.)
Professional Development Education Workshops

Fall teacher workshops provide free parking, meals, curriculum, classroom materials, great networking and in some cases continuing education units. Teachers must register for workshops at smud.org/Education. For information on these workshops or custom workshops for your district contact Suzette.Bienvenue@smud.org.

Thursday, September 5, 2019
Crazy Electric Circuits with Legos (Grades 3 - 9)
Folsom Community Center
52 Natoma Street, Folsom
4:30 – 7:30 p.m.

Electric Circuits are highly recommended for fourth grade teachers preparing for Next Generation Science Standards in electricity. Davin Bowker of the San Juan Unified School District will lead educators through a variety of crafting make-and-take activities in which they will learn how to build and diagram circuits as well as presentation strategies necessary to support NGSS. Teachers will receive a classroom Circuit Maker Space set and Legos.

Wednesday, September 18, 2019
The Real Reasons for Seasons (Grades 5 - 10+)
Folsom Community Center
52 Natoma Street, Folsom
4:30 – 7:30 p.m.

The seasons come and then pass, but can you explain the reasons why? Research shows that understanding and explaining the causes of seasons can be challenging for people of all ages. This GEMS® workshop is aimed at teaching educators to help students arrive at a clear understanding of seasons as they investigate the connections between the Sun and Earth. Teachers will take a “Trip to the Sun,” determine the real shape of the Earth’s orbit, evaluate actual data on world temperature and hours of sunlight in different locations and model how the angle at which sunlight hits the Earth affects its concentration. This lesson was developed in partnership with the NASA Office of Space Science Sun-Earth Connection Education Forum (SECEF). Teachers will receive a GEMS guide.

Wednesday, September 25, 2019
Hack Your Notebook (Grades 5 - 12)
SMUD Energy Education & Technology Center – Rubicon Room
6301 S Street, Sacramento
4:30 – 7:30 p.m.

Learn how to use journaling and notebooking to combine expressive design and storytelling with the basics of circuitry. You will be introduced to circuit traces, copper tape use, polarity and simple circuit design, and you’ll get practice integrating simple pop-up forms and features. This workshop will use NEXMAP’s “Hack Your Notebook series – Illuminate Your Thinking” and “Working with Paper Circuitry and Engineering your Materials – Working with Pop-up.”

Thursday, September 26, 2019
Computational Thinking and Coding (Grades 3 - 8+)
SMUD Energy Education & Technology Center – Rubicon Room
6301 S Street, Sacramento
4:30 – 7:30 p.m.

How do we solve gigantic and mathematically difficult problems? “With computers” is just part of the answer because scientists, mathematicians and engineers need to learn how to structure problems so computers can help. Computational thinking is part of both the Next Generation Science Standards and California Computer Science Standards. Come and enjoy a hands-on introduction with Stephen Callahan from the SJCOE FabLab to explore this critical topic. Bring a laptop or Chromebook. Each teacher will receive a micro-bit starter kit.
Thursday, October 10, 2019
Papercraft and Computation – An Introduction to Coding with the Chibi Chip (Grades 5 - 12)
SMUD Energy Education & Technology Center – Lighting Classroom
6301 S Street, Sacramento
4:30 – 7:30 p.m.

Teachers who are familiar with the basics of paper circuitry (see “Hack Your Notebook” class) can learn how to introduce basic coding activities into their projects. Participants will work on a series of take-home templates that use the Chibi Chip and the MakeCode visual block programming language in a series of scaffolded projects: a blink sketch, an illumination sequence and an alternating circuit with switch. Participants are required to bring their preferred device for browser-based programing: either a tablet, laptop or phone to connect to the internet. Each participant will receive a Chibi Chip.

Tuesday, October 22, 2019
GEMS® Spooky Science of Energy Transformation (Grades 4 - 12)
Folsom Community Center
52 Natoma Street, Folsom
4:30 – 7:30 p.m.

Energy transformation can be mysterious and spooky! Teachers will focus on science investigations and develop the skills to foster their student’s “inquiry abilities”, all in a Halloween themed class. We’ll explore sublimation and other energy transformations which will help support student skills in observations, experimentation and inference. Teachers will receive a light dinner, GEMS guide and classroom materials.

Monday, November 4, 2019
Energy, Carbon and Life (Grades 5 - 12)
SMUD Energy Education & Technology Center – Rubicon Room
6301 S Street, Sacramento
4:30 – 7:30 p.m.

Explore the interdependence of plants and animals and the crucial role of the sun’s energy for a healthy ecosystem. Teacher of the Year, Anne Tweedy will guide participants in using scientific probes to gather quantitative data about carbon dioxide levels in different energy rich and energy poor environments. Teachers will analyze and apply the data gathered to construct scientific explanations and develop cycle of matter and energy transfer models. Participants will also explore how humans impact the levels of carbon on earth by finding our carbon footprint and designing solutions for maintaining healthy human, plant and animal relationships on our earth. This workshop will address NGSS standards 5-LS2-1, 5-LS2, MS-LS2, HS-LS2.

Thursday, November 14, 2019
Project Planning Using Human Centered Design and Paper Circuitry (Grades 6 - 12)
SMUD Energy Education & Technology Center – Lighting Classroom
6301 S Street, Sacramento
4:30 – 7:30 p.m.

Participants will learn the thinking and communication strategies for cultivating class projects. Using a six panel, 11x17 template, teachers will complete a series of design activities in response to a shared prompt and theme for idea generation. Timed activities include the use of sticky notes, abstraction laddering, building importance/difficulty matrices, storyboarding and the integration of illumination and paper circuitry. Feedback and small group work are used in this session.

Thursday, December 5, 2019
Project WET: Solving Waterborne Mysteries! (Grades 5 - 12)
SMUD Energy Education & Technology Center – Rubicon Room
6301 S Street, Sacramento
4:30 – 7:30 p.m.

People are dropping like flies – can you figure out why? Join us for an evening exploring activities to engage students in the use of data, evidence and patterns to identify and track a variety of waterborne agents of illness. This interdisciplinary workshop experience will feature Project WET activities that integrate concepts and skills at the heart of Common Core and Next Generation Science Standards. Participants will receive a copy of each activity and a kit of materials.
Save the date for the Electricity Fair

Join us for a day of fun at the family-focused 8th Annual Electricity Fair at the Folsom Powerhouse State Historic Park on Saturday, Sept. 14, 10 a.m. - 2 p.m. This action-packed event invites you to participate in electric activities, tour the Historic Powerhouse, visit with Mr. Electricity, check out the latest electric vehicle models as well as make and take several electric and solar experiments.

How to build a solar charger workshop for teachers

Has your smart phone battery died because you didn’t have a way to charge it? Why not use a solar powered phone charger to prepare for any kind of emergency?

SMUD provides teacher workshops to build a phone charger powered by the sun. The building is relatively simple, but the engineering challenge arises in designing and creating the ability to properly charge, store and carry the device.

SMUD workshops engage teachers in developing design and engineering challenges to present to their students using only recycled products. Some of the design features of this workshop focus on portability for camping, accessibility for hanging in trees, foldability to teach the mathematics of the sun’s radiation angles and sometimes just adding a fashion statement by designing solar charging purses.

If you’re interested in this design and engineering challenge, please contact Suzette.Bienvenue@smud.org.

Note: SMUD supplies some components for this STEM activity, while supplies last (Appropriate for grades 8 - 12).
2019 Sacramento Science Olympiad

SMUD was a sponsor of the 2019 Sacramento Science Olympiad, which brought students together from the Sacramento Region to use math, scientific knowledge and quick thinking to solve problems. Students are required to respond to complex questions in areas ranging from plant life and bird calls to designing cars powered by rubber bands and even building towers which can hold measured weight.

The winners of the 2019 competition are:

**Middle School Division:**
1st place: Winston Churchill - Team A
2nd place: Winston Churchill - Team B
3rd place: Winston Churchill - Team C

**High School Division:**
1st place: Mira Loma
2nd place: Sheldon
3rd place: Pleasant Grove

Learn more and get involved at SacramentoScienceOlympiad.com

Powerhouse Science Center

The Powerhouse Science Center offers many field trip opportunities for elementary school students. From robots, to electricity, to the Challenger Space Experience and Planetarium, the Center staff delivers valuable STEM programs. The Center can even ignite excitement for science learning in custom classes for home schooled students.

SMUD sponsors a custom electricity lab activity which teaches students about circuits. Check it out and get your students charged up!

Can’t get to the museum? The museum can come to your classroom or science night with a variety of hands-on activities and science experiences.

For more information on how your class can benefit from the exhibits, classes and workshops at the Powerhouse Science Center, visit PowerhouseSC.org/educators
SMUD’s 8th annual California Solar Regatta was a tremendous success this year. The spirit of competition and innovation could be felt out on the water as more than 600 high school and college students from throughout California took part in the race at the Rancho Seco Recreational Area. High school and college students from all over California raced full-sized, solar-powered boats they designed and built themselves at the competition which was held on May 3 and 4.

The event is designed to help inspire students to pursue educational and career paths in STEAM (science, technology, engineering, art and math) fields. In order to participate, students must utilize renewable energy and technological skills they have learned in school and apply them in a practical, hands-on way.

Twenty high schools and seventeen college teams competed in speed, slalom and endurance races and also presented a thorough view of the design and building process of their boats to an audience.

**Awards**

**Friday, May 3 – High School Competition**

Regatta Cup Winner:  #9 Laguna Creek High School
Best Drive Train:  #10 Boy Scouts
Best Video:  #11 School of Engineering and Sciences
Leading by Example:  #16 Pasteur Middle School
Artistic:  #6 Leonardo Da Vinci

**Saturday, May 4 - College Competition**

Regatta Cup Winner:  #5 San Francisco City College
Best Drive Train:  #5 San Francisco City College
Best Video:  #5 San Francisco City College
Leading by Example:  #7 Ohlone Community College
Artistic:  #11 CSU Humboldt State University

Sustainability:  #11 School of Engineering and Sciences
Technical:  #13 Arcadia High School
Presentation:  #8 Folsom High School
Endurance:  #13 Arcadia High School
Speed:  #6 Leonardo Da Vinci
Slalom:  #9 Laguna Creek High School

**2019 California Solar Regatta**

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High school students build self-driving race car

Students at Cosumnes Oaks High School were looking for a challenge beyond typical robotics competitions, so they formed the Autonomous Circuits Racing Team (ACRT/COHS). Over the course of a year, the afterschool club learned how to code and build a self-driving racecar - essentially an autonomous robot!

To learn how to build an autonomous race car, the team participated in the Beaver Works Laboratory at MIT and the Beaver Works Summer Institute (BWSI). The free MIT program provides all the course curriculum necessary to learn how to build and program the robots. No prior experience is necessary. Participants learn Python, Robot Operating System, Gazebo simulator (for running simulations of the race car without hardware access), computer vision and Linux. The team was able to work on their own time and also together on campus to complete their project.

This is not a typical school learning experience. Participants work on a guided, rigorous and comprehensive online Python course prepared by the Beaver Works lab at MIT. It's available at no cost for both middle and high schools and gives students an opportunity to work with advanced topics that MIT's BWSI program makes both fun and manageable for students.

The ACRT/COHS team was supported by their teacher, Melissa Hale and a great team of mentors at BWSI led by Dr. Robert Shin. The team was the first group of students in our region to complete the programing course and build the race car, which cost about $600 dollars in parts. MIT's BWSI has asked ACRT to expand and reach out to more schools to set up their own teams. If you are a student, teacher, parent or mentor interested in starting an autonomous race car team or for more information, contact the ACRT team at info@acrtcohs.com.
Sixth grade teacher Aaron Siberman of Orangevale Open Elementary School believes that a rolling stone gathers no moss. Siberman has a deep and spiritual belief in sustainability, renewable energy and agriculture. Looking for ways to teach these values to his students, he applied for grants to assist in developing meaningful programs for his classroom.

Aaron was awarded admission to the Common Vision program which for a very small fee offers fruit orchards to schools. Common Vision’s mission is to create a healthier society by planting the orchards at schools in California.

The trees bring shade, food and a connection to agriculture and nature making schools more sustainable. The organization also provides appropriate curriculum to support and ensure students will grow strong and healthy trees. To learn how you can bring an orchard to your school, visit CommonVision.org

Intel also awarded a grant to Siberman to invest in an automated planting, weeding and watering system called the FarmBot. By using FarmBot, students can easily see how technology interacts with agriculture.

In 2018, SMUD provided a scholarship for Siberman to attend the Solar Schoolhouse Institute where he spent a week learning about everything solar from the geometry of the sun to how to fabricate his own solar module. Siberman returned to Orangevale Open with lots of great ideas on how to integrate solar energy into his curriculum. SMUD is donating 60W solar modules to his winning project concept of having each of his classroom periods design a solar powered watering system for their plots in the school garden.

Moral of this story…don’t hesitate to look for community partners to help support your ideas. If you have a project or an interesting idea using solar energy at your school, contact Suzette. Bienvenue@smud.org

Powering Futures
Scholarships

SMUD offers annual college scholarships (up to $5,000 per student). Applicant’s must be enrolled or planning to enroll as a full-time undergraduate student at an accredited 2 or 4 year college/university in the U.S in the fall of 2020. Learn more at smud.org/Scholarships.
Science Bowl Competition

The Science Bowl is a fast-paced academic competition put on by the Western Area Power Administration (WAPA) that tests students’ knowledge in all areas of science and mathematics.

In the 2019 Regional Science Bowl, 13 high schools vied for the prestigious top prize of an all-expenses-paid trip to the National Science Bowl held April 26-29 in Washington, D.C.

Mira Loma’s High School Team 1 took first place, followed by Vista Del Lago Team 1 in second and Davis Senior High in third.

SMUD sponsors the Sacramento Science Bowl by providing volunteers and prizes for the school science departments that place second through sixth. SMUD’s support allows almost everyone to feel like a winner in this competition!

This year, WAPA added a Career Opportunity area where local companies and colleges were available to provide students and parents information about scholarships, internships and tours. A new photo booth was a big hit and added a little fun to the event. Good Day Sacramento and Fox40 News were onsite to interview students, coaches and volunteers.

The 29th Sacramento Regional Science Bowl will take place Feb. 29, 2020! Team registration begins in October 2019. Schools can enter more than one team to participate in this one-of-a-kind regional competition for the chance to represent Northern California at the National Science Bowl in spring 2020.

If your high school is interested in learning more about this great event, contact Michael Locke at Locke@wapa.gov.

Pictured Laguna Creek High School

Pictured Mira Loma High School
Jesuit High School uses STEM for good

Several Jesuit High School students used STEM to help improve the lives of communities in Tanzania. Teacher Jordon Brown learned how to build solar CooKits with SMUD, and his students used their new skills this summer during a visit to Tanzania. While there, the students taught locals how to use the power of the sun to cook, reducing the use of fossil fuels which can be dangerous and promote illnesses caused by smoke. To discover how you can bring solar cooking to your classroom, contact Suzette.Bienvenue@smud.org.

Online content for teachers

Did you know that SMUD offers free digital content for teachers at smud.org/Education? We offer curriculum, lesson plans and videos including NGSS standards, teacher guides, student worksheets and templates. You can find topics such as how to introduce robotics to young students and how to teach circuitry using art. Check back often as we are always upgrading and adding to our content.

Learn all the different ways that SMUD creates electricity for our region at smud.org/Education.

Cardboard or Whatever Regatta

On May 24, Folsom High School celebrated its 12th annual Cardboard Regatta. With this event, students learned STEAM concepts and had fun on the water as they experimented with materials properties, buoyancy and density science. Top prizes included speed, slalom and the Mark Twain award which was given to the craft which held the most students before sinking. The event is open to students in the region. For more information, contact Erick Wright at EWright@fcusd.org.
Sacramento Regional STEM Fair

Once again, SMUD was a big supporter of the Northern California STEM Education Foundation’s Sacramento Regional STEM Fair, held this year on April 6, at American River College. The Fair is a 12-county science, technology, engineering and math competition for students in grades 6-12. Students in grades 5-11 can participate in a non-judged showcase division. Participants learn about the scientific process, hear from their peers about a multitude of STEM projects and visit the College & Career Expo to find out more about career pathways into STEM. SMUD staff handed out Best in Energy trophies to the following students:

Middle School

From Trash to Gas
Aryah Hubbard was interested in the idea of using cow poop to create natural gas for renewable energy and she wanted to know if cow poop would work better if mixed with vegetation. She experimented with cow samples collected with help from her grandfather and a variety of vegetable compost. She found that cow poop by itself was the least effective and the best mixture for producing gas was a mixture of cow poop and bananas.

High School

Automated Lawn Robot
Porth Pirankar and sisters Estella and Selena Wong of Vista Del Lago designed and built an automated, remote controlled lawn watering system. They have plans to fine tune the project by adding water sensors to test the lawn for watering needs.

This trio have taken all of the IT workshops available at their high school and have been taking accelerated technology classes at Folsom Community College. Porth would like to explore a career in aeronautics and Estella and Selena are both interested in careers which combine technology and medicine.

For more information about the Sacramento Regional Science and Engineering Fair go to SacStemFair.org.

Charge Up Change!

SMUD is hosting a new competition for middle school students in Sacramento County. Any student in grades 7 - 8, individually or with a team of up to three can create a two-minute movie or public service announcement touting the benefits of driving electric. The movie may be humorous or educational or both!

For a flyer and rules for the competition, visit smud.org/Education.

Submissions will be uploaded to YouTube and must not contain offensive or copyrighted material.

To receive an application and submit an entry, email Suzette.Bienvenue@smud.org. Winners will receive prizes and scholarships at a ceremony in December.

Application deadline is Friday, October 18, 2019.

Final project deadline is Wednesday, October 30, 2019.
SMUD Solar Car Races

More than 140 local high school students competed in the 14th Annual SMUD Solar Car Race at Cosumnes River College on April 24. It was a great way to learn about renewable energy and celebrate Earth Week.

It was a hot and sunny day giving teams the “fuel” they needed to get their cars across the finish line. The students all used the same solar panels, motors and gear sets, but each car was unique. Of the 70 cars that raced, some were very creative and built of unusual materials like Legos, water bottles and other recyclables. One team even made a mockup of the Raiders of the Lost Ark: Temple of Doom. It was up to the teams to be creative and innovative and build the fastest car possible.

Teams competed in several award categories. SMUD also presented the Grit and Gumption Award which went to the team who persevered through adversity and found positive ways to meet challenges to get their car on the track. **Congratulations to this year’s winners!**

1st Place Laguna Creek
2nd Place College Track
3rd Place Laguna Creek
Innovative Engineering & Design College Track
Sustainability Award Laguna Creek
Stock Award El Camino
Judges Award Cordova
Artistic Award Laguna Creek
Grit and Gumption Award Valley

Learn more about how to integrate Solar Sprint Racing into your curriculum or how your high school can participate in the 2020 SMUD Solar Car Race contact etcmail@smud.org.