

Engaging in  
**STEM EDUCATION**  
 [ SCIENCE + TECHNOLOGY + ENGINEERING + MATH ]  
 to prepare all learners  
 for the challenges and opportunities  
 in the 21st century economy



## SAILING into SCIENCE

### OREGON 4-H MARINE AMBASSADORS CAMP HOOKS YOUTH'S INTEREST IN SCIENCE

A group of Oregon high school-aged youth sailed the seas with a 64-foot research vessel, Ocean Watch, to dip into a new program aimed at increasing interest and awareness of marine science.

**4-H Marine Ambassadors Camp** participants receive a hands-on experience at Oregon State, the OSU Hatfield Marine Science Center and along the Oregon coast learning about beach ecology, tide pools, fresh water ecosystems, estuaries, tsunamis — including studying debris from the 2012 tsunami in Japan — and more.

“The fact that it’s hands-on really drew me to it because it’s something I wouldn’t get regularly in my high school,” says Kayla Mackie, camp participant (pictured at right). “I’m glad they’re taking this opportunity to bring students here.”

The 4-H Marine Ambassadors Camp is conducted by the **College of Public Health and Human Sciences** with support from the **OSU Extension Service**, National 4-H Council and Samsung Corporation to educate the public about the health of the ocean and how changes in the waters impact various ecosystems, human life and Oregon’s climate.

Ninety-eight percent of last year’s participants say they now have an increased interest in science, 92 percent plan to take care of the ocean and nearly 75 percent are thinking of pursuing a career in marine science.



## Science everywhere

Despite enthusiasm and preparation, any new teacher faces the challenges of managing a classroom and dealing with the high stakes of testing. Now imagine teaching science to students whose first language is not English.

For many teachers, this experience is increasingly the norm. Nearly 10 percent of all K-12 students spoke a first language other than English, according to the 2012-13 Oregon Statewide Report Card. This statistic is similar nationwide.



A new collaboration between the **OSU Extension Service** and partners aims to empower pre-service teachers to engage culturally and linguistically diverse students in STEM fields. The College of Public Health and Human Sciences' 4-H youth development program, OSU's College of Education and the Science and Math Investigative Learning Experiences (SMILE) program are working together on the program, called "**Families Involved in Education Sociocultural Teaching and STEM,**" or **FIESTAS**. It serves youth in 3rd through 5th

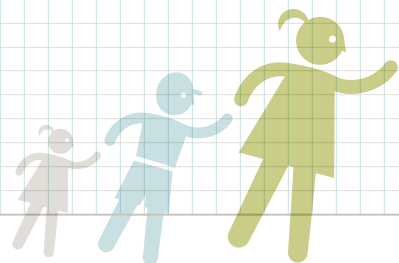
grades with after-school 4-H clubs at Lincoln and Garfield elementary schools in Corvallis in partnership with the Boys & Girls Club.

Through activities such as field trips to the city swimming pool to learn about the chemistry of chlorination, children learn to see science everywhere, said Ana Lu Fonseca (pictured above), a 4-H outreach coordinator who helped develop the curriculum.

For Kyle May, a first-year graduate student at OSU studying math education, the experience has helped him adapt better to a multi-lingual classroom.

"The language barriers have been challenging, with multiple students who speak different languages. I try to put them in a position so that they are confident talking in another language," May said.

In one school year, 56 pre-service teachers engaged with youth around science and math concepts inside and outside the classroom, according to Fonseca. Forty-nine youth, including 29 Latino children, completed an average of 13.5 hours of experiments, demonstrations and other experiential learning activities related to energy use.



**Through a new open education initiative,** OSU is making select online educational materials free for learners around the world to access. STEM modules, like one on DNA replication, are currently in development. See an example at [outreach.oregonstate.edu/engage](http://outreach.oregonstate.edu/engage).



## Outreach to rural students

### Mobile engineering camps deliver STEM education in communities across Oregon

Middle school is a critical time for students to develop interest in STEM learning and the perfect time to begin prepping for college. Oregon State University's **Mobile Science and Engineering Camps**, or Mobile E-Camps, are offering students and parents an opportunity to learn about both, and have fun doing it.

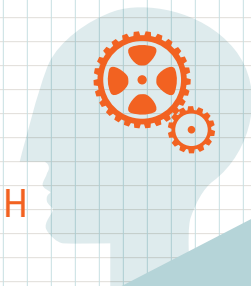
Mobile E-Camps include two days of hands-on activities where students explore scientific concepts and sustainable engineering practices, while parents learn how to facilitate their children's path toward higher education.

Serving over 1,000 students in its first four years, Mobile E-Camps are offered all summer long at 12 locations across the state. These programs reach

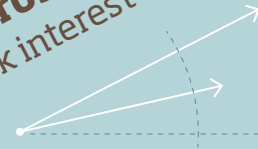
ENGAGING MINDS WITH

SCIENCE ENGINEERING  
TECHNOLOGY MATH

STEM



Portland Parkrose project  
aims to track interest in STEM



→ rural Oregon communities and allow both students and parents to feel at home, often in their own schools. Kyle Cole, Director of Precollege Programs at OSU, says the camps promise to engage students with highly relevant STEM activities that bridge the gap between school and summer learning.

In efforts to achieve larger gains in college enrollment in STEM fields, Cole believes parental involvement is the cornerstone for success. At the end of each Mobile E-Camp, parents assist students in their final project: to design and race their own solar-powered car.

This summer Cole hopes to spur even more parent involvement and introduce **Adopt-a-Classroom**, a mentoring program where OSU student mentors reach students via Skype throughout the school year to discuss topics students are studying in school and to motivate their college planning.

“Instilling a belief that students can achieve a higher education and a rewarding career is the goal,” says Cole.



In the Parkrose community, a diverse neighborhood in northeast Portland, OSU researchers Lynn Dierking, John Falk and Nancy Staus are in the middle of a study to understand how children access and use STEM resources in their daily lives.

With funding from the Noyce Foundation, OSU's **SYNERGIES** project has been tracking over 200 Parkrose youth from elementary to middle school age, their peers, siblings and significant adults in their lives since 2010. Preliminary findings indicate that youth entering 7th grade are still interested in pursuing STEM learning, but research shows this enthusiasm will taper off in the next two years unless they are engaged in out-of-school STEM activities.

**The long-term project goal is to use these data to develop specific strategies and tools to improve STEM learning in Parkrose that can be broadly applied to long-term improvements in STEM public education locally, nationally and internationally.**

One improvement, a weekly afterschool STEM club at the middle school, a partnership with **OSU Extension's 4-H Metro team**, has already seen a turnout of over 40 youth in just two meetings. Researchers hope that similar efforts might change these youths' STEM engagement trajectories.

## What makes people want to learn?

Since 2004, **Oregon Sea Grant's Free-choice Learning** program has been working to understand and support the marine science learning that happens when people choose to visit science museums, zoos and aquariums in their leisure time, making specific and conscious choices about what they learn.

Currently, Oregon Sea Grant is working under a five-year, \$2.6 million grant from the National Science Foundation to create a new free-choice learning lab at **OSU's Hatfield Marine Science Visitor Center** in Newport (pictured at right). Under the grant, Dr. Shawn Rowe is leading a team conducting innovative research at the Visitor Center, collaborating with the public to gain a deeper understanding of what and how visitors learn.



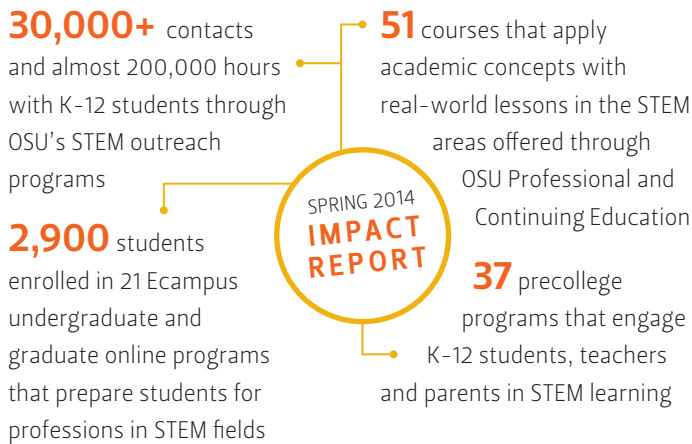
### Free-choice learning:

*All the learning we do outside the classroom!*

## When math meets science

For more than 25 years, **Oregon State's SMILE (Science and Math Integrated Learning Experiences) Program** has been working to increase post-secondary enrollment of underserved populations in the STEM fields. There are over 825 SMILE alumni currently enrolled in college and College Connection events, such as the Ocean Science Challenge, are a major component to this success.

This year's Challenge event provided 120 high school students from 10 statewide SMILE clubs with a real world opportunity to apply what they had been learning about the topic of Marine Resource Management. **More than 15 university and community partners and 20 undergraduate mentors guided students as they learned about Marine Protected Areas (MPAs) off of the Oregon Coast** and then used their knowledge to increase community awareness of MPAs through the creation of interpretive signs, a newscast and a final presentation.



***“Our STEM-focused outreach and engagement programs are developing continually to meet the needs of a diverse population of learners. Working with community partners, we seek to engage people in STEM fields for the lifelong benefit of healthy people, a healthy planet and a healthy economy.”***

***— Dr. Scott Reed, Vice Provost, University Outreach and Engagement***



**Outreach and  
Engagement**

The Division of University Outreach and Engagement connects Oregon State University to the rest of the world by making its educational programs accessible wherever and whenever people need to learn. The division provides leadership across campus for the outreach and engagement mission and includes the OSU Extension Service, Extended Campus and Professional and Continuing Education.

Oregon State University  
101 Ballard Hall  
Corvallis, OR 97331-3606  
(541) 737-2713  
[outreach.oregonstate.edu](http://outreach.oregonstate.edu)