



California STEM Service-Learning Initiative

California Department of Education



**Linking Science, Technology,
Engineering and Mathematics
(STEM) to Real World Issues and
Needs**

*Supported by a grant from the
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California STEM Service-Learning Initiative

California Department of Education

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**Why is it important to be
STEM Literate ?**

**Who goes into
STEM Careers and Why?**



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Public Perceptions

Scientists

Creates economic growth	25%
Would make a strong leader	32%
Cares about the community	51%
Save lives	82%
Sensitive to societal concerns	61%
Protects the environment	71%
Improves the quality of life	71%

AAES/Harris Polls, 2003

Purdue Engineering

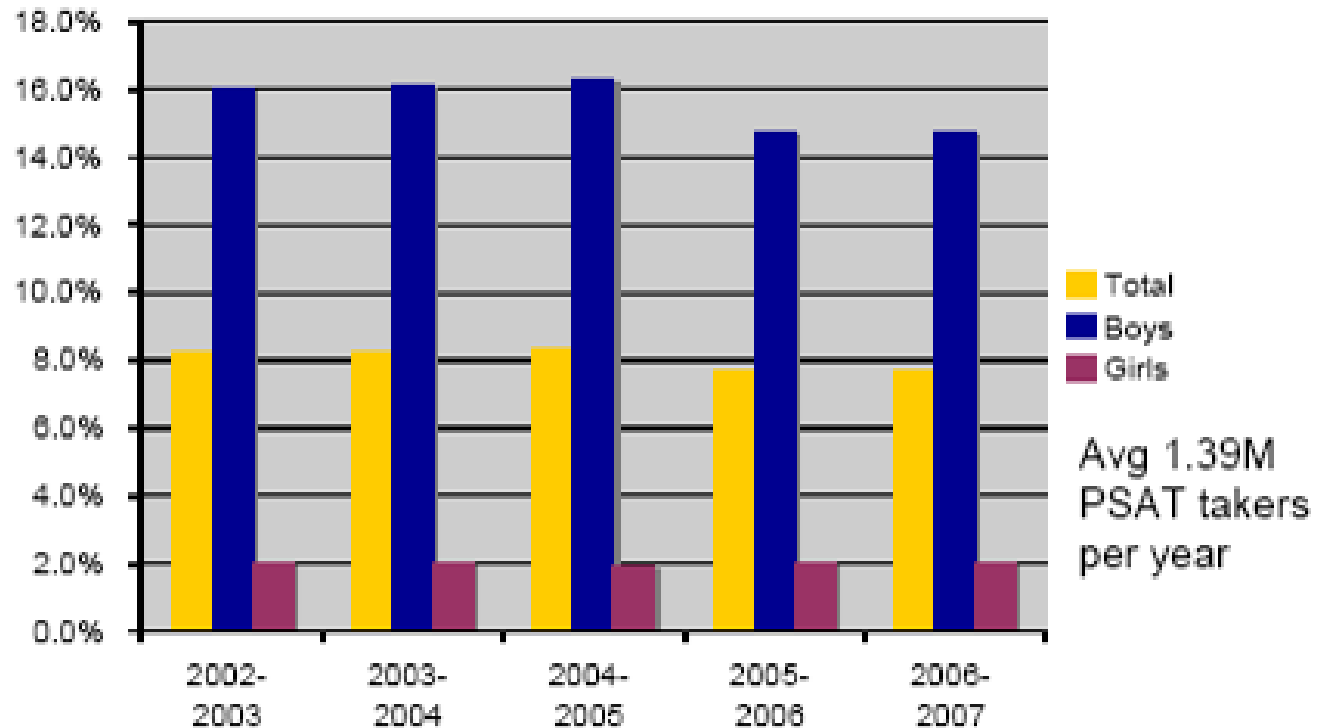
THINK IMPACT





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US High School Students' Interest in Engineering Major



Source: http://www.collegeboard.com/researchdocs/2006_psat.html

Purdue Engineering

THINK IMPACT





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Who will become an Engineer???

- A decline in student interest in taking STEM-related course work.
- Young women and minority students continue to be under-represented compared to the overall population.
- 85% of students see engineering as boring or nerdy (NEA 2008).

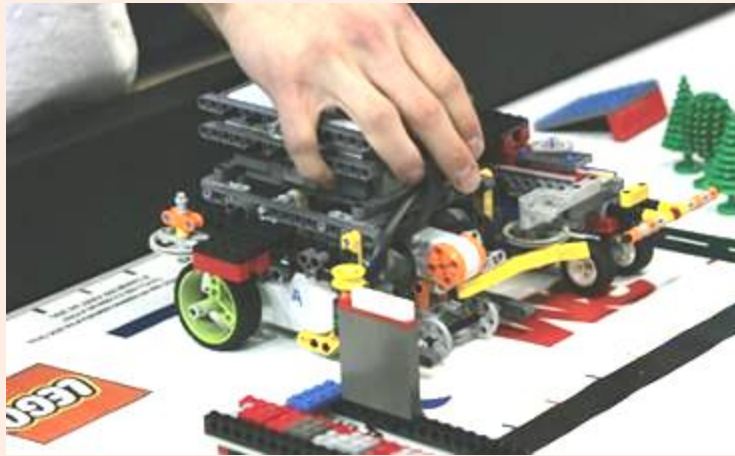




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Changing the Perception

From



To





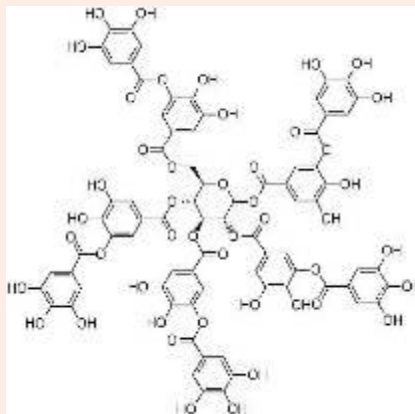
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Changing the Perception

From



To





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Changing the Perception

We must change the perceptions of STEM careers, in order to bring more people into STEM careers.

From	To
You have to love math and science	The application of math and science have important benefits to society
Its challenging, but if you work hard you can do it	I work hard to make a difference and give back to the community
I don't see people like me becoming scientists	I know someone like me who is an engineer



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What is Service-Learning?

Service-learning is an instructional method where students learn the content standards through engaging in activities that provide service to the community.

The service provides a context for learning.



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Community Service VS Service-Learning

Community Service

- Meets community needs and links school to community
- Builds students' sense of civic responsibility

Service-Learning

- Meets community needs and links school to community
- Builds students' sense of civic responsibility
- Provides structured time for reflection
- ***Is an instructional method***



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What is STEM-Based Service-Learning?

- Uses service-learning to deliver the STEM and Career Technical Education content
- Provides opportunity to engage in real world projects that make a difference
- Builds relationships between students and partners
- An example of Linked Learning done well
- Changes the perceptions about STEM knowledge and careers



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STEM Service-Learning Project Examples



*Solar Panel
Installation*





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LAUSD Irrigation System Mapping





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LAUSD Water Conservation Project

LAUSD and Water: The Los Angeles Unified School District (LAUSD) is the largest landowner and water and energy customer in the City of Los Angeles. LAUSD schools' water usage in 2008 was 2.0 billion gallons, which is roughly equivalent to a football field of water over 6,000 feet tall!

A Reducible Expense: LAUSD spends a significant amount of money on water. In 2008, the average monthly water bill for the district was \$672,427. The average monthly water bill in 2008 was \$1,826 for a middle school and \$3,235 for a high school.



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LAUSD Water Conservation Project

Below is a table showing the monthly water bills for an LAUSD High School in July 2008, and July 2009. The savings are due to LADWP water restrictions and greater awareness about water shortages.

LAUSD	Water Bill July 2008	Water Bill July 2009	Water Bill July 2010
High School	\$3235	\$2985	

Q: If the savings continued at the same rate what would the water bill be in July 2010?

Plot this information on a graph, and develop an equation to describe the situation.

Q ; When will the water bill be less than \$2000? Explain how you can use your graph and the equation you developed to answer this question.



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Monterey Trail High School



- Students studied campus waste management & litter issues
- Designed prototype solar trash compactor
- Designed recycling video games to educate and raise awareness





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Energy Project Youth Corps



- Energy Audits with funding from PG&E
- Students partner with UC Davis students & faculty to conduct energy audits and make recommendations on home & school energy conservation
- Outreach projects

DaVinci Charter Academy



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Students design and build a “pedal desk” that powers a laptop computer

Robotics for After School



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- Einstein Education Center, Woodland
- Students learn how to build and program robots
- Teach students in an elementary after school program





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Calvine High School, Elk Grove



- Strawberry Creek Monitoring Project
- 5th year of science classes monitoring creek that is adjacent to the school
- Award winning project



McFarland Ranch, Galt



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- Galt youth in an after school program partner with local construction firms and local historical society to restore a historical building



Curb to Creek, Fairfield



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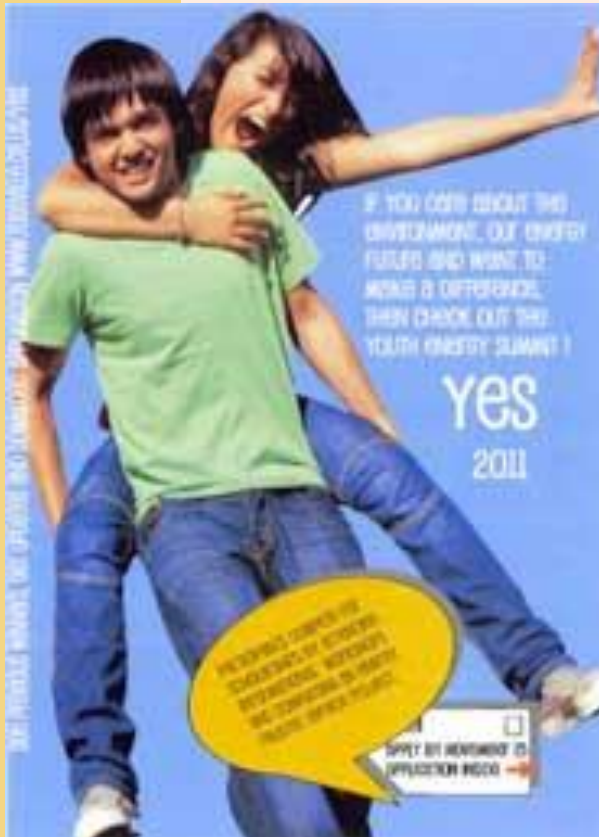
- Students in environmental science classes study storm water runoff issues
- Conduct community & school investigations
- Design and implement solutions to problems they identify
- Partner with Fairfield-Suisun Sewer District and UC Davis JMIE



Youth Energy Summit (YES)



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- Hosted by SMUD (Sacramento Municipal Utility District), Roseville Electric and Lodi Electric
- Step One: Youth attend 1.5 day energy seminar and receive college credit



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Youth Energy Summit

- Step Two: Teams of 2-6 students work with a mentor to design and implement an energy-related service project





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Youth Energy Summit

Students assemble "solar suitcases" for use in developing countries.





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Youth Energy Summit

- **Bicycle Solar Ambulance:** Solar array provides power to support emergency medical devices while shading patient.
- **Energy Patrol Contest:** Students create a contest in which schools in the district compete to see which school can lower the school's energy bill the most.
- **Sustainable Gardening:** Transportable planter and compost system to educate community about drip irrigation and composting.

Youth Energy Summit



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- Step 3: Students present their projects at an event on the Capitol steps
- Team of judges evaluate the projects
- Winning students receive scholarship money

Youth Energy Summit winners with Sacramento Mayor Kevin Johnson on the steps of the Capitol



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Envirolution: Truckee High “*Trashion*” Show



- Students raise awareness with fun and flair
- Student assemblies promote environmental stewardship
- Every student receives a conservation kit



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Table Work

- Taking it Back Home -

- What are you already doing?
- Who are your partners?
- What are your interests?
- What are you teaching that can be taught with service-learning?
- What would your students be interested in?



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Table Work

- Making it High Quality -

- Are the standards clearly identified?
- Is there a real community need being met?
- How will students help shape and lead the project?
- Who are the community partners: Higher Education, Industry, Community Based Organization?
- What makes the project of interest to underrepresented youth?



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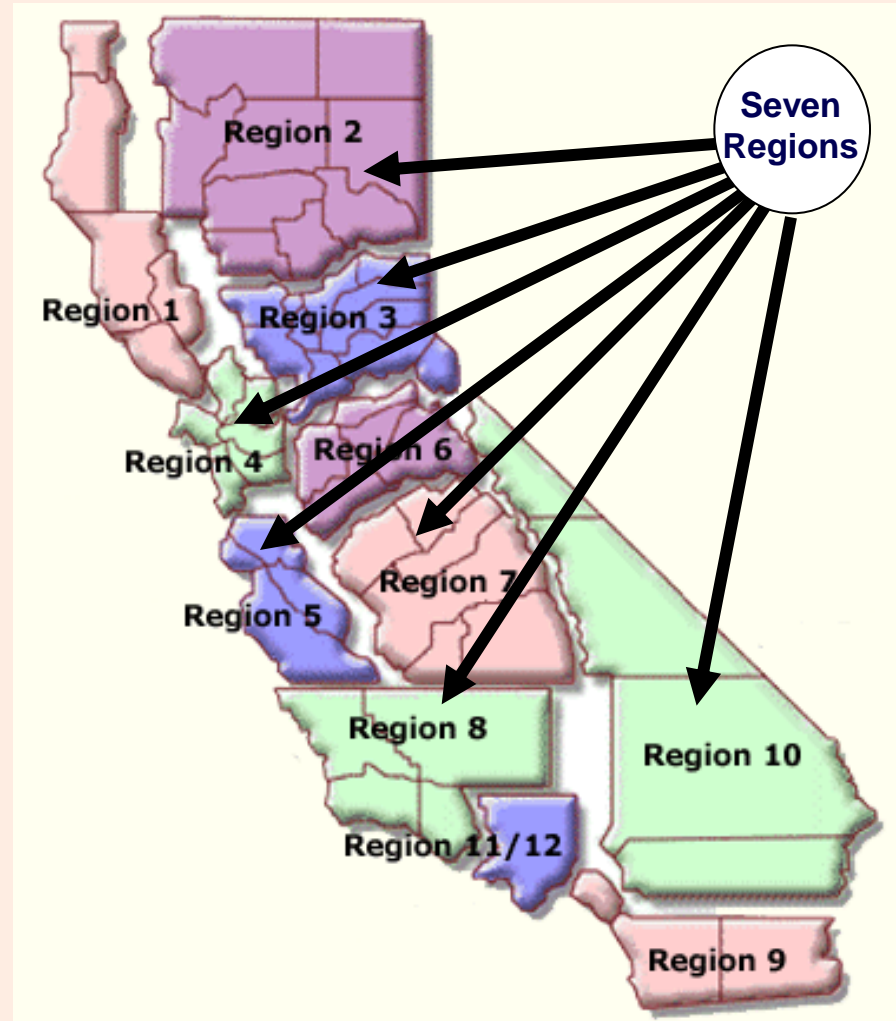
- To increase the number of youth prepared to be STEM literate members of our democracy and, the engineers, scientist and technologists of tomorrow
- Targeted recruitment and retention of young women and minorities
- Support Regional STEM Service-Learning Consortia statewide
- Conduct evaluation to identify best practices and for program improvement



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Regional STEM Service-Learning Consortia

CalSTEM.org





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Regional STEM Service-Learning Consortia

- Build STEM-based collaborative partnerships among school districts, higher education, community partners and industry
- Identify and support STEM-based service-learning Projects Teams (Teams)
- Support the Consortium's Teams with resources and, training and technical assistance
- Conduct evaluation to investigate outcomes at the regional, partner and Team, levels



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STEM Service-Learning Project Teams

Team Members

- Secondary (grades 7-12) students and teachers
- Higher education students and faculty
- Community-based organizations
- Industry partners
- STEM project advisors

**Drop-off box
for
CFL lighting...**



Contacts

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