Information Conference

Preparing Students for the Global Economy

Cal Poly Pomona
January 16, 2015

Sponsor:
What is Project Lead The Way?

PLTW is the nation’s leading provider of science, technology, engineering, and math (STEM) curriculum for elementary, middle and high school students.
PLTW’s Three Key Components:

- World-Class Curriculum
- High-Quality Professional Development
- Engaged Network

- LEADERSHIP • INNOVATION • CONTINUOUS IMPROVEMENT • ACCOUNTABILITY
What Students do Well in PLTW?

Students Who:

• Show interest in STEM (Science, Technology, Engineering, or Math) career fields.
• Are creative – Like art and design.
• Enjoy working with computers.
• Learn best in “hands-on” classes.
• Are in the upper 80% of their class.
Why Do We Need PLTW?

The United States ranks 17\textsuperscript{th} in science achievement; 25\textsuperscript{th} in math ability out of 65 countries.

By 2018...

- STEM jobs will grow by 17 percent
- 1.2 million STEM jobs will go unfilled
World Class-Curriculum

PLTW Launch

PLTW Gateway

PLTW Engineering & Biomedical Science

College, career, and beyond
World Class-Curriculum

- All PLTW curriculum is activity-, project-, problem-based.
- PLTW curriculum aligns with Common Core and Next Generation Science Standards.
- Our curriculum is designed and consistently reviewed and improved by:
  - PLTW teachers
  - University educators
  - Industry experts
  - School administrators
Curriculum Programs
Curriculum Programs

- **Elementary School K-5: Launch**
  - 24 total modules (4 modules per grade)

- **Middle School: Gateway to Technology**
  - 8 units

- **High School: Pathway to Engineering**
  - 8 courses

- **High School: Biomedical Science**
  - 4 courses

- **High School: Computer Science**
  - CSE course + six new courses (under development)
• Students decide as early as second and third grade whether they like, and think they are good at, math and science.
  – *We need to reach them first.*

• 65 percent of scientists and graduate students in a 2010 study stated that their interest in science began before middle school.

• Topic-based modules engage students in design problems, collaboration, analysis, problem solving, and computational thinking.
Activity, project, problem-based

Aligned to Common Core Math and English State Standards and Next Generation Science Standards

Allows for flexibility and customization
- Designed for Kindergarten to 5th grade
- Four modules per grade. Each module is ~10 hours.

First module of each grade focuses on the design process

Integrates formative and summative assessments
PLTW three-phased approach fully supports elementary STEM teachers:

Readiness Training
- On-demand and live-online
- Focus on core knowledge/skill

Core Training
- 3 days in-person training for the program
- Focus on pedagogy and activity, project, problem-based learning

Ongoing Training
- On-demand and live online by module
- Focus on pedagogical-content knowledge by module
<table>
<thead>
<tr>
<th>Working title</th>
<th>Standards alignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Structure and Function</td>
<td>Kindergarten</td>
</tr>
<tr>
<td>• Pushes and Pulls</td>
<td>Kindergarten</td>
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<tr>
<td>• Waves: Light and Sound</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; grade</td>
</tr>
<tr>
<td>• Observing the Earth, Sun, Moon, and Stars</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; grade</td>
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<td>• Matter and Materials Science</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt; grade</td>
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<tr>
<td>• Engineering Design: Dispersing Seeds</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt; grade</td>
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<tr>
<td>• Motion and Stability: Science of Flight</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt; grade</td>
</tr>
<tr>
<td>• Motion and Stability: Forces and Interactions</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt; grade</td>
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<tr>
<td>• Energy: Collisions</td>
<td>4&lt;sup&gt;th&lt;/sup&gt; grade</td>
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<tr>
<td>• Energy: Conversion</td>
<td>4&lt;sup&gt;th&lt;/sup&gt; grade</td>
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<tr>
<td>• Robotics: The Power of Automation</td>
<td>5&lt;sup&gt;th&lt;/sup&gt; grade</td>
</tr>
<tr>
<td>• Robotics: Challenge</td>
<td>5&lt;sup&gt;th&lt;/sup&gt; grade</td>
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</tbody>
</table>
Animal rescue activity

Aligned to 3rd grade standards
PLTW Gateway

PLTW’s Gateway Program is a strong foundation for further STEM learning in high school and beyond, challenging students to develop and apply 21st century knowledge and skills to solve real-world challenges.
Program Requirements Summary

- All PLTW Gateway units are designed as nine-week units on a standard 45-50 minute schedule.
- Schools may offer courses from grade six through grade eight in a manner they determine reasonable and appropriate for their school. Local schools will determine the PLTW sequence of units they will implement to fulfill their agreement.
Middle School Program
9 week units designed for grades 6-8

Foundation Units
• Design and Modeling
• Automation and Robotics

Specialization Units
• Magic of Electrons
• Flight and Space
• Medical Detectives
• Energy and the Environment
• Green Architecture
• Science of Technology
Foundation Units:

- **Design & Modeling**
  - Apply design process to solve problems.
  - Work in teams to design a hobby organizer, furniture, new playground.
  - Use Autodesk® design software to create virtual image of designs and produce a portfolio of solutions.

- **Automation & Robotics**
  - Learn about mechanical systems, energy transfer, machine automation, and computer control systems.
  - Use the VEX Robotics® platform to design, build, and program real-world objects.

[AR End Project]
Specialization Units:

• **Flight and Space (FS):** Students explore the science behind aeronautics and use their knowledge to design, build and test an airfoil. Custom-built simulation software allows students to experience space travel.

• **Magic of Electrons (ME):** Through hands-on projects, students explore the science of electricity, behavior and parts of atoms, and sensing devices. Students acquire knowledge and skills in basic circuitry design and examine the impact of electricity on our lives.
Specialization Units:

- **Science of Technology (ST):** How has science affected technology throughout history? To answer this question students apply the concepts in physics, chemistry and nanotechnology to STEM activities and projects.

- **Medical Detectives (MD):** Medical Detectives (MD) explore the biomedical sciences through hands-on projects and labs that require students to solve a variety of medical mysteries. Students investigate medical careers, vital signs, diagnosis and treatment of diseases, as well as human body systems such as the nervous system.
Specialization Units:

- **Energy and the Environment (EE):** Students investigate the impact of energy on our lives and the environment. They design and model alternative energy sources and participate in an energy expo to demonstrate energy concepts and innovative ideas.

- **Green Architecture (GA):** In this unit, students are introduced to architectural plans, construction styles, alternative materials and processes, dimensioning, measuring and architectural sustainability. Students use a 3D architectural software program to create an environmentally friendly home using shipping containers.
High School Program

Foundation Courses
• Introduction to Engineering Design
• Principles Of Engineering

Specialization Courses
• Aerospace Engineering
• Biotechnical Engineering
• Civil Engineering and Architecture
• Computer Integrated Manufacturing
• Digital Electronics
• Computer Science and Software Engineering

Capstone Course
• Engineering Design and Development
All PLTW Engineering courses are designed as year-long courses on a standard 45-50 minute schedule.

Local schools will determine the PLTW sequence of courses they will implement.
Foundation Courses

- Introduction to Engineering Design (IED)
  - Introduces the design process and how engineers use it to solve problems

- Principles of Engineering (POE)
  - Covers basic concepts in engineering and exposes students to a wide variety of engineering fields
Introduction To Engineering Design Overview

**IED Units**

- Design Process
- Technical Sketching and Drawing
- Measurement and Statistics
- Modeling Skills
- Geometry of Design
- Reverse Engineering
- Documentation
- Advanced Computer Modeling
- Design Team
- Design Challenges

[Image: IED Cube]
Principles Of Engineering Overview

A hands-on project-based course:

POE Units
- Energy and Power
- Control Systems
- Materials and Structures
- Statistics and Kinematics

Projects
- Solar Hydrogen System
- Truss Design
- Pneumatic Brake System
- Self-Propelled Vehicle
Specialization Courses

- **Aerospace Engineering (AE)**
  - Learn the fundamentals of atmospheric and space flight through projects such as designing an airfoil, propulsion system, rocket and glider

- **Biological Engineering (BioE)**
  - Students investigate and design solutions to solve real-world challenges related to world food security, renewable energy and clean drinking water.

- **Civil Engineering and Architecture (CEA)**
  - Discover the design and construction industry while designing both residential and commercial projects using Autodesk® 3D-architectural design software.
Specialization Courses

• Computer Integrated Manufacturing (CIM)
  – Explore designing products for manufacturability, manufacturing processes, CNC machining, factory system modeling, automation, and robotics

• Digital Electronics (DE)
  – Learn the fundamentals of combinational and sequential logic circuit design and create fully-functioning digital circuits

• Computer Science and Software Engineering (CSE)
  – Engages students in projects and problems to address the fundamental question: How do creative abstraction and computational power change our lives?
Aerospace Engineering Overview

AE Units
• Introduction to Aerospace
• Aerospace Design
• Space
• Alternative Applications

Projects
• Airfoil Simulation
• Rocket Engine-Testing
• Glider Design
• Space Junk Mitigation
BioE Units
• Biological engineering for a better tomorrow
• Water
• Food security
• Renewable fuels

Projects
• Students investigate the role and effectiveness of biological organisms in cleaning up water polluted with crude oil.
• They investigate the process of photosynthesis and its role in the formation of both fossil fuels and biofuels.
Civil Engineering & Architecture Overview

CEA Units
- Overview of Civil Engineering & Architecture
- Residential Design
- Commercial Applications
- Commercial Building Systems

Projects
- Green Utility Shed
- Keystone Library Renovation
Computer Integrated Manufacturing Overview

CIM Units
- Principles of Manufacturing
- Manufacturing Processes
- Elements of Automation
- Integration of Manufacturing Elements

Projects
- Freight Elevator
- Container Design
- Autonomous Pick and Place

CIM 2013
Computer Science and Software Engineering Overview

CSE Units
- Graphics
- The Web
- Data Mining
- Simulation

Project
- Students will engage in problems involving large sets of data and social networks. Will emphasize how computational thinking can put existing code to great use. Students use databases of genetic information and health records, will utilize a face-recognition API for Python and will use MIT’s App Inventor to develop an Android app.
PLTW Computer Science

Computer Science High School Program

Courses:
Introduction
• Introduction to Computer Science (ICS)
Foundation
• Computer Science and Software Engineering (CSE)
• Computer Science Applications (CPA)
Specialization
• Simulation and Modeling (SAM)
• Artificial Intelligence (AI)
• Cybersecurity (SEC)
Capstone
• Computational Problem Solving (CPS)
Digital Electronics Overview

DE Units
• Fundamentals of Analog and Digital Electronics
• Combinational Logic
• Sequential Logic
• Microcontrollers

Projects
• Board Game Counter
• Date of Birth Problem
• Elevator Door
Capstone Course

- Project Management
- Researching a Problem
- Designing a Solution
- Creating a Prototype and Testing Plan
- Evaluation and Reflection on the Design Process
- Presentation of the Design Process
- Going Beyond Engineering Design and Development
Biomedical Science - High School Program

Students play the roles of biomedical professionals as they investigate and study the concepts of human medicine, physiology, genetics, microbiology, and public health.
Courses:

- Principles of the Biomedical Sciences
- Human Body Systems
- Medical Interventions
- Biomedical Innovations
Principles of the Biomedical Sciences (PBS)

Units

• The Mystery
• Diabetes
• Sickle Cell Disease
• Heart-Disease
• Infectious Disease
• Post Mortem
Case Evidence

- Crime Scene Sketch
- Persons of Interest
- Anna Garcia Case Report
- Anna Garcia Food Diary
- Anna Garcia Nutrient Analysis Resource Sheet
- Anna Garcia Heart Attack Risk Assessment Report
- Anna Garcia Cause of Death Organizer
Human Body Systems (HBS)

Units

- Identify
- Communication
- Power
- Movement
- Protection
- Homeostasis
Medical Interventions (MI)

Units

• How to Fight Infection
• How to Screen What is in Your Genes
• How to Conquer Cancer
• How to Prevail When Organs Fail

Example: DNA Alteration

• Students insert new DNA into bacteria cells
• New DNA codes for a protein that glows
Biomedical Innovation (BI) Capstone

Capstone Course

• Project Management
  – Work with an Faculty Advisor or Field Mentor
• Researching a Problem
• Designing a Solution
• Review Findings and Results
• Presentation of Project
Program Requirements Summary:

- All PLTW courses require concurrent enrollment in college preparatory mathematics and science courses.

- All PLTW courses are designed as year-long courses on a standard 45-50 minute schedule. For schools with double period / block scheduling, these courses can be completed in a semester.
## Sample Four Year Schedules

### Potential STEM Pathways

<table>
<thead>
<tr>
<th>Middle School</th>
<th>9th grade</th>
<th>10th grade</th>
<th>11th grade</th>
<th>12th grade</th>
<th>Post-secondary</th>
<th>Career fields</th>
</tr>
</thead>
</table>
Professional Development
Professional Development

Counselors and Administrators

Teachers

State Leaders and Affiliates
High-quality Professional Development for Teachers

- Three Phases:
  - Readiness Training
  - Core Training
  - Ongoing Training
Cal Poly Pomona - TENATIVE
June 15 – June 26: IED & POE
July 6- July 18: IED, CIM, EDD
July 6 - July 10: DM
July 13- July 17: AR
July 19 – July 21: LTT
July 22 – July 24: LTT
July 20- July 31: CSE & POE
July 20- July 24: AR
July 27 – July 31: DM & ICS

San Diego State University - TENTATIVE
June 15 - June 26: IED, POE, AE, CSE, AR, DM
June 29- July 1: LTT
July 6- July 17: IED, POE, CEA, DE
July 20 – July 24: MD, ST & ICS
July 20- July 31: LTT

San Jose State University - TENTATIVE
June 15 – June 26: LTT
July 20- July 31: IED, POE & CSE

Registration Opens: March-April
Cal Poly Pomona will host a Refresher Workshop – Feb. 6, 2015

5-hour Hands-On Training with Master Teachers and Affiliate Professors

• Review VEX kits
• Review ROBOTC
• Review Inventor
• Current PLTW Teachers
• Lunch included
CA STEM Summit

March 16-17, 2015
Los Angeles

A gathering of STEM teachers, educators, administrators, business and community partners to learn and share ideas in support of STEM Education in California

http://www.castemsummit.com/
PLTW National Summit

November 2-5, 2014
Indianapolis, Indiana

A gathering of STEM teachers, educators, administrators, business and community partners to learn and share ideas in support for the PLTW program

Sessions included presentations on:
The Industry Classroom Connection
Experience PLTW Launch in Action
Getting Started with PLTW’s Innovation Portal
Promoting Your PLTW Program to Success
PLTW Computer Science: It’s More Than Fun and Games
New to Project Lead The Way? Here’s How to Get Started
Femineers: A Model for Attracting and Retaining Girls in STEM
A gathering of STEM teachers, educators, administrators, business and legislative partners to learn and share ideas in support for the PLTW program

Sessions include presentations on:
What’s new in PLTW CA, the Biomedical program, best practices in the classroom, integrating math and science into PLTW courses, community college participation, grants and funding, updates on course curricula, University and business partnerships
Program Implementation & Cost
All PLTW Courses are “A-G” Approved

Approved as “g” electives:
- Intro to Engr. Design (interdisciplinary)
- Digital Electronics (math)
- Principles of Engineering (interdisciplinary)
- Aerospace Engineering (interdisciplinary)
- Civil Engr. & Architecture (interdisciplinary)
- Computer Integrated Manufacturing (other)
- Biotech Engineering (science-biological)
- Engineering Design and Dev. (interdisc.)
All PLTW Courses are “A-G” Approved

**Approved as “f”, Visual & Performing Art:**
- Introduction to Design
  - (optional approval for IED)

**Approved as “d”, Lab Science:**
- Engineering Design and Development
  - (optional if taught by a science teacher)
- Principles of Biomedical Sciences
- Human Body Systems
Future A-G efforts will focus on changing interdisciplinary electives to science electives so they can satisfy the new CSU entry option.

Updates available at www.pltwca.org

Or the UC “a-g doorways” portal; search under Project Lead the Way.
Novel Implementations

• Combine classes, one teacher in a block;
  – Teach IED and Geometry
  – Teach POE and Physics
• Use at low-performing academies to grab the forgotten middle that sleeps through lecture.
• School within a school.
• Use as the core of a magnet academy (the Kearny Construction Technology model).
The Most Important Things you will Hear Today…

- PLTW is an Elective;
- You must recruit students, especially girls.
- You must have passionate teachers.
School District Commitments

- Implement PLTW curriculum
- Support teachers in Professional Development
- Counselors participate in conferences
- Provide teachers with specified equipment
- Form a teacher-led partnership team
- Participate in student evaluation of PLTW
- Commit to on-going training opportunities
- Interact with PLTW State Leader
- Option to become certified PLTW school
Participation Fee Model

- Annual Participation Fee (includes software):
  - PLTW Gateway $750
  - PLTW Engineering $3000
  - PLTW Engineering fee reduced from $3000 to $1750 for schools who have previously purchased the ADA Perpetual License.
  - PLTW BMS $2000
  - PLTW CSE $2000
Estimated Cost to Schools

- Participation fee
- Teacher training:
  - Engineering registration fee $650 to $2,500 depending on the length of the course training
  - Housing: $135 per night at Kellogg West
- Facilities (need a computer lab + prototyping/project lab)
- Equipment (course dependent costs)

- AE: $10,000
- BE: $5,000
- CEA: $3,000
- CIM: $20,000
- DE: $7,000
- EDD: $1,500
- Gateway: $5,000-10,000 per module
- POE: $10,000
- IED: $1,000
- CSE: $2200-4400
- PBS: $7,000
- HBS: $9,000
- MI: $7,000
- BI: $2,000
What does the participation fee cover?

- The participation fee covers program support features including:
  - Readiness and ongoing professional development for teachers
  - Unlimited seats for all required software
  - Live school and technical support
  - Student recognition and scholarship opportunities
  - Networking opportunities through the PLTW Alumni Association
  - Industry certification opportunities
  - Transparency to post-secondary opportunities (credits, admissions preference, etc.)
  - Opportunities to interact with PLTW corporate partners
  - Best practice sharing
  - Expanded teacher pipeline
  - Customizable print materials

- Access to a suite of support applications, including:
  - Learning Management System
  - End of course assessments
  - Teacher forums
  - On-line e-Catalog
  - Reporting tools
  - Registration and rostering system
  - Score reporting tool

Curriculum is still free to participating schools!
Typical PLTW Gateway Implementation Timeline

Academic Year (Aug. – July)

Year 1:  - Attend Information Conference
         - Sign District Agreement
         - Teacher attends Summer Training in DM & AR

Year 2:  - Offer DM & AR
         - Teacher attends Summer Training in a specialty course

Year 3:  - Offer DM & AR and specialty course
Academic Year (Aug. – July)

Year 1:  
- Attend Information Conference
- Sign District Agreement
- Teacher attends Summer Training in IED

Year 2:  
- Offer IED
- Teacher attends Summer Training in POE

Year 3:  
- Offer IED and POE
- Teacher attends Summer Training in a specialty course

Year 4:  
- Offer IED, POE, and specialty course
Typical PLTW BMS Implementation Timeline

**Academic Year (Aug. – July)**

**Year 1:**
- Attend Information Conference
- Sign District Agreement
- Teacher attends Summer Training in PBS

**Year 2:**
- Offer PBS
- Teacher attends Summer Training in HBS

**Year 3:**
- Offer PBS and HBS
- Teacher attends Summer Training in MI

**Year 4:**
- Offer PBS, HBS, and MI
- Teacher attends Summer Training in BI
<table>
<thead>
<tr>
<th>Some Deadlines</th>
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</thead>
<tbody>
<tr>
<td>Summer Training Schedule Posted</td>
<td>Jan/Feb</td>
</tr>
<tr>
<td>New District or School Signups</td>
<td>March 1</td>
</tr>
<tr>
<td>Registration for summer training</td>
<td>Mar/Apr</td>
</tr>
<tr>
<td>Signed Agreement (if a new District)</td>
<td>May 1</td>
</tr>
</tbody>
</table>
Recruiting Techniques

• Recruit a “rock star” teacher

• Take PLTW students and projects to other classes.

• Student demographics should match the ones you want to recruit

• Recruit at the Middle Schools
Recruiting Techniques

- Help the Middle Schools run the Gateway program
- Tell parents using PTA, local papers, and “Elective Fairs”
- Start a Robotics Team
- Work on making the courses girl friendly; teach “Design” not “Pre-Engineering”
Recruiting Techniques

• Project Lead The Way has released recruitment materials designed to encourage more girls to take PLTW classes

• Focus Your Future - Designed for hosting a reception for girls and their parents to learn more about PLTW

• See also “Engineer Your Life” – A guide to engineering for high school girls; see more at www.engineeryourlife.org  Judy Lee  Erin Fletcher  SHSE at CPP
Preparing Students for the Global Economy
State and Regional Program Support
The California Regional Centers

- Conduct summer training sessions
- Hold informational conferences
- Conduct professional development workshops for the PLTW teachers
- Promote the PLTW program within California
- Provide student programs and benefits
Student Support

- Scholarships ... Leonhard Scholarship at SDSU
- Design Competitions
- Engineering Compact with SDSU
- Summer Engineering Camps, called Gateway Academies, for middle schools
Community College Participation

- Riverside City College, El Camino College, and Cerritos College offer PLTW courses.

- Articulation between HS and CC.
College Credit Options with a Community College

• Find a community college that accepts PLTW High School Courses and gives credit for them.

• The community college will issue a transcript that a CSU campus will accept if it has ‘articulation with the community college.'

• Example of a community college that has “articulation” with Cal Poly Pomona is El Camino College
Rochester Institute of Technology (RIT) and CPP

- Effective Fall 2001: RIT 0618-301 Digital Fundamentals can be used for PLTW Digital Electronics. This articulates to CPP courses: For ET major: ETT201/L(3/1) and ECET major: ETE 230/L (3/1)

- Effective Fall 2002: RIT course 0617-262 Solid Modeling and Design can be used for PLTW Introduction to Engineering. This articulates to CPP course MFE126/L (2/1)
• Note: there is a certain fee involved in getting these credits

• Also depending on the major the student is applying for, the course might not be a part of the major’s requirements.
Growth & Sustainability
Continuous Growth and Achievement

PLTW continues to grow

- Founded by Dick Blais and Richard Liebich
- PLTW started with 11 schools in upstate New York in 1997
- More than 6,500+ currently offering PLTW courses to their students in 50 states & District of Columbia
- 18,956+ teachers trained (6,137 during summer training 2014)
- 51 Affiliate Universities/100+ university relationships
PLTW Schools in CPP Service Area

CPP became PLTW Affiliate
CPP Engineering First Time Freshmen From PLTW Schools

<table>
<thead>
<tr>
<th>Year</th>
<th>Fall 2009</th>
<th>Fall 2010</th>
<th>Fall 2011</th>
<th>Fall 2012</th>
<th>Fall 2013</th>
<th>Fall 2014</th>
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<td>76</td>
<td>135</td>
<td>146</td>
<td>202</td>
<td>250</td>
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</tbody>
</table>
Percent of CPP Engineering First Time Freshmen From PLTW Schools

- Fall 2009: 9%
- Fall 2010: 13%
- Fall 2011: 19%
- Fall 2012: 20%
- Fall 2013: 26%
- Fall 2014: 23%
Business & Industry Support

From Local Business and Charities

- Chevron
- QUALCOMM - endowment to SDSU/PLTW
- Small Manufacturers Institute
- Northrop Grumman – People & $
- Regional workforce development agencies
- SME – Sponsors summer camps
- Irvine and Gates Foundation
Grants to Cal Poly Pomona to support PLTW

- The Boeing Company
- Sempra Energy Foundation
- Southern California Gas Company
Recognition & Partnerships
National Recognition

National Academy of Engineering, National Academy of Science and the Institute of Medicine October 2005

- PLTW program is recommended as the model curriculum for creating “K-12 rigorous curricula, standards and assessments based on world-class standards.”

- “Students participating in PLTW courses are better prepared for college engineering programs.”
Chevron’s Partnership with Project Lead The Way

Chevron champions science, technology, engineering and math (STEM) education in the U.S. from K to 12 and beyond. Through our programs and strategic partnerships, we help students and teachers get the tools and resources they need to take advantage of every opportunity STEM offers.

Chevron’s innovative partnership with Project Lead the Way has brought rigorous engineering opportunities to 111 programs in 7 states where we operate.

Together we have reached over 80,000 students nationally through our comprehensive partnership which includes:

- Engineering programs and equipment in schools
- Teacher professional development
- Creation of an online engineering portfolio and collaboration tool – the Innovation Portal
- Chevron Engineering Design Challenge competitions
- Employee volunteers and leadership
- Local and national conferences

Cal Poly Pomona's Commitment to STEM
“PLTW did not find us, we found them! PLTW is the premier STEM program in the U.S. to Toyota officials for two main reasons. Students are engaged EVERY DAY in problem solving activities and work EVERY DAY in teams! We also know that PLTW maintains its up-to-date curriculum, provides a unique and rigorous teacher professional development model, and their schools are certified for quality. We actively recruit PLTW Students.”

Dennis D. Parker  
North American Headquarters  
Toyota, Inc.  
Georgetown, KY 40324
Engineering Academies

Designed to:

- Recruit Middle School students into the Gateway® program as well as the High School Engineering™ program.
- To excite and inspire students to participate in STEM coursework and enter post secondary education and the workforce in engineering and engineering technology.

Design Elements:

- Special emphasis is placed on recruiting females and under represented minorities.
- Summer Day Camp for entering 6th & 7th graders.
- Utilizes PLTW® curriculum.
- Taught by teachers who are trained to teach PLTW® curriculum.
<table>
<thead>
<tr>
<th>West Coast</th>
<th>Mountain</th>
<th>Midwest</th>
<th>Southwest</th>
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<td>Oregon Institute of Technology</td>
<td>NM State University</td>
<td>Sinclair Community College</td>
<td>Oklahoma Tech University</td>
<td>University of New Haven</td>
<td>University of Tennessee-Chattanooga</td>
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<td></td>
<td></td>
<td>Iowa State University</td>
<td>Wichita State University</td>
<td>University of Kentucky</td>
<td>University of Kentucky College of Engineering</td>
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<tr>
<td>Region</td>
<td>Biomedical Sciences National Affiliates</td>
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<tr>
<td>West Coast</td>
<td>California State University</td>
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<tr>
<td></td>
<td>Stanford University</td>
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<tr>
<td></td>
<td>Washington State University</td>
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</tr>
<tr>
<td>Midwest</td>
<td>University of Texas at Tyler</td>
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<tr>
<td></td>
<td>Missouri University of Science and Tech.</td>
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<td></td>
<td>IUPUI</td>
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</tr>
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<td>Southwest</td>
<td>Stevenson University</td>
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<td></td>
<td>University of Oklahoma Health Sciences Center</td>
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<td>Northeast</td>
<td>Duke University</td>
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<tr>
<td>Southeast</td>
<td>University of Kentucky</td>
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<tr>
<td></td>
<td>University of Colorado</td>
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</tbody>
</table>
Preparing Students for the Global Economy
Research Findings
How Well is PLTW Working?

- **95%** intend to pursue a post-secondary degree
  - Vs. **67%** nationally (National Center for Education Statistics)

- **70%** say they will study a STEM related post-secondary degree program
  - Vs. **32%** nationally (Center on Education and Work)

- The percentage of female students in PLTW engineering programs continues to be about **19%**
  - Vs. **18%** nationally (American Society for Engineering Education)
At Galt High, PLTW students take one class per school year, beginning in 9th grade:

- Introduction to Engineering Design
- Principles of Engineering
- Civil Engineering and Architecture
- Computer Integrated Manufacturing

Critical Question:
What impact, if any, has Project Lead the Way had in closing the achievement gap for Hispanic/Latino students?
PLTW Makes a Difference

Results:
“For the fifth year in a row, students participating in Project Lead the Way scored higher than students at Galt High School in all 5 subject areas on the California Standards Tests (CST)”

(Analysis of Student Achievement and Programs 2010, Galt Joint Union High School District)
PLTW Makes a Difference
CST Scores at Galt High School

**English Language Arts**

- **All GHS Students**: 931 Tested
- **All PLTW**: 59 Tested

<table>
<thead>
<tr>
<th>Level</th>
<th>All GHS</th>
<th>PLTW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced</td>
<td>21%</td>
<td>47%</td>
</tr>
<tr>
<td>Proficient</td>
<td>26%</td>
<td>20%</td>
</tr>
<tr>
<td>Basic</td>
<td>30%</td>
<td>22%</td>
</tr>
<tr>
<td>Below Basic</td>
<td>13%</td>
<td>3%</td>
</tr>
<tr>
<td>Far Below</td>
<td>10%</td>
<td>7%</td>
</tr>
<tr>
<td>Total</td>
<td>345.11</td>
<td>376.75</td>
</tr>
</tbody>
</table>

**Mathematics**

- **All GHS Students**: 854 Tested
- **All PLTW**: 57 Tested

<table>
<thead>
<tr>
<th>Level</th>
<th>All GHS</th>
<th>PLTW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced</td>
<td>3%</td>
<td>9%</td>
</tr>
<tr>
<td>Proficient</td>
<td>16%</td>
<td>35%</td>
</tr>
<tr>
<td>Basic</td>
<td>31%</td>
<td>25%</td>
</tr>
<tr>
<td>Below Basic</td>
<td>40%</td>
<td>28%</td>
</tr>
<tr>
<td>Far Below</td>
<td>10%</td>
<td>4%</td>
</tr>
<tr>
<td>Total</td>
<td>306.96</td>
<td>336.63</td>
</tr>
</tbody>
</table>

**Science**

- **All GHS Students**: 829 Tested
- **All PLTW**: 54 Tested

<table>
<thead>
<tr>
<th>Level</th>
<th>All GHS</th>
<th>PLTW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced</td>
<td>16%</td>
<td>33%</td>
</tr>
<tr>
<td>Proficient</td>
<td>29%</td>
<td>31%</td>
</tr>
<tr>
<td>Basic</td>
<td>32%</td>
<td>20%</td>
</tr>
<tr>
<td>Below Basic</td>
<td>11%</td>
<td>4%</td>
</tr>
<tr>
<td>Far Below</td>
<td>12%</td>
<td>11%</td>
</tr>
<tr>
<td>Total</td>
<td>342.66</td>
<td>369.33</td>
</tr>
</tbody>
</table>

**Social Science**

- **All GHS Students**: 441 Tested
- **All PLTW**: 28 Tested

<table>
<thead>
<tr>
<th>Level</th>
<th>All GHS</th>
<th>PLTW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced</td>
<td>29%</td>
<td>71%</td>
</tr>
<tr>
<td>Proficient</td>
<td>28%</td>
<td>18%</td>
</tr>
<tr>
<td>Basic</td>
<td>22%</td>
<td>4%</td>
</tr>
<tr>
<td>Below Basic</td>
<td>9%</td>
<td>---</td>
</tr>
<tr>
<td>Far Below</td>
<td>11%</td>
<td>7%</td>
</tr>
<tr>
<td>Total</td>
<td>361.69</td>
<td>422.57</td>
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</tbody>
</table>

**Research Findings**
Graduation Rates

- The Engineering Academy has historically outperformed the school as a whole.

www.ed-data.k12.ca.us
San Jose High Academy

Students in the PLTW engineering academy (about 30% of the total school population) scored over 15% higher than the school average in every category in their CAHSEE.
## Closing the Achievement Gap

**Martin Luther King High School, Riverside, CA**

<table>
<thead>
<tr>
<th>CST Math Scores - Averages</th>
<th>9th</th>
<th>10th</th>
<th>11th</th>
</tr>
</thead>
<tbody>
<tr>
<td>36 total seniors presently in program who have completed 2 or more PLTW classes</td>
<td>383</td>
<td>374</td>
<td>377</td>
</tr>
<tr>
<td>Rest of King HS</td>
<td>334</td>
<td>313</td>
<td>311</td>
</tr>
<tr>
<td>Difference</td>
<td>+49</td>
<td>+61</td>
<td>+66</td>
</tr>
<tr>
<td>27 seniors currently in EDD (capstone) who have completed entire program</td>
<td>386</td>
<td>378</td>
<td>379</td>
</tr>
<tr>
<td>Rest of King HS</td>
<td>334</td>
<td>313</td>
<td>311</td>
</tr>
<tr>
<td>Difference</td>
<td>+52</td>
<td>+65</td>
<td>+68</td>
</tr>
</tbody>
</table>

The evidence shows that students in PLTW show more growth in Math than students that are not in the program. Students who have been in the program for all 4 years and complete every class show even more growth.
Getting Started with PLTW

Biomedical Sciences

Gateway To Technology

Pathway To Engineering

“My future groundbreaking work in laminar flow control will start here in your classroom.”
Websites

Cal Poly Pomona PLTW:
http://www.csupomona.edu/~engineering/diversity/pltw/index.html

PLTW CA:
www.pltwca.org

PLTW National:
www.pltw.org
PREPARING STUDENTS FOR THE GLOBAL ECONOMY