Information Conference
Preparing Students for the Global Economy
Cal Poly Pomona
March 20, 2015
What is Project Lead The Way?

PLTW is the nation’s leading provider of science, technology, engineering, and math (STEM) curriculum for 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

Need for PLTW
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
  – 9 courses
• High School: Biomedical Science
  – 4 courses
• High School: Computer Science
  – CSE course + six new courses (under development)
LAUNCH K-5
65 percent of scientists and graduate students in a 2010 study stated that their interest in science began before middle school.
Launch is an integrated STEM program that is hands on, engaging and meets Common Core and NGSS for students in grades K-5.
PLTW Launch

Comprises Three Types of Lessons Similar to PLTW in High School

- **Engineering & Technology**
  - Currently in network release
  - Two modules per grade level, K-5
  - Modules average ~ 10 hours each

- **Biomedical Science**
  - To be released 2015-2016 school year
  - One module each, K-5

- **Computer Science**
  - To be released 2015-2016 school year
  - One module each, K-5
Activity-, Project-, Problem- Based Curriculum
K Structure and Function: Exploring

- Students will discover the design process and how engineers influence their lives.
- Students apply new knowledge and skills as they utilize the design process to design, sketch, build, test, and reflect on projects such as a new tool design.
Module Introduction

- Fictional Story
- Design Process
Build a Beanstalk

• As part of an introduction to the design process, the students will model a beanstalk using pipe cleaners with a goal of creating the tallest model possible.

• Now, it’s your turn!
PLTW launch

Scalable, school-wide model for elementary core training

Trainers

PLTW → Master Teachers → Lead Teachers → PLTW Teachers

PLTW three-phased approach fully supports elementary STEM teachers:

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

**Core Training**
- 2.5 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
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.
• 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
• Civil Engineering and Architecture
• Computer Integrated Manufacturing
• Computer Science and Software Engineering
• Digital Electronics
• Environmental Sustainability

Capstone Course

• Engineering Design and Development
Program Requirements Summary

• 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
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

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

POE Marble Sorter
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.

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

- **Computer Integrated Manufacturing (CIM)**
  - Explore designing products for manufacturability, manufacturing processes, CNC machining, factory system modeling, automation, and robotics.
Specialization Courses

- **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?

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

- **Environmental Sustainability (ES)**
  - Students investigate and design solutions in response to real-world challenges related to clean and abundant drinking water, food supply issues, and renewable energy
Aerospace Engineering Overview

AE Units

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

Projects

• Airfoil Simulation
• Rocket Engine-Testing
• Glider Design
• Space Junk Mitigation
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
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
ES Units
• Biological engineering for a better tomorrow
• Ensuring safe and abundant 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.
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.
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
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)
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
PBS Unit One: The Mystery Activities and Projects

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 a 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>
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<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>
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<tbody>
<tr>
<td>Design/Modeling Automation/Robotics Science of Technology Magic of Electrons</td>
<td>Introduction to Engineering Design</td>
<td>Principles of Engineering</td>
<td>Biomedical Engineering</td>
<td>Engineering Design and Development</td>
<td>Certificate 2-yr degree 4-yr degree</td>
<td>Green technology Biotechnology Chemical engineering</td>
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Professional Development
Professional Development

State Leaders and Affiliates

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**
June 15 – June 26: IED & POE  
July 6 – July 10: DM  
July 6 – July 17: IED, CIM, EDD  
July 13 – July 17: AR  
July 19 – July 21: LTT  
July 20 – July 24: AR  
July 20 – July 31: CSE & POE  
July 22 – July 24: LTT  
July 27 – July 31: DM & ICS

**San Diego State University**
June 14 – June 19: DM  
June 14 – June 26: IED, AE, CSE  
June 22 – June 26: AR  
June 29 – July 1: LTT  
June 29 – July 3: MD  
July 5 – July 17: IED, POE, CEA, DE  
July 19 – July 22: ST  
July 19 – July 24: MD, ICS  
July 20 – July 22: LTT  
July 23 – July 25: LTT

Registration Opened: March 16

[PLTW Video](#) (5 min)
Professional Development

Cal State Chico
June 14 – June 26: POE
June 15 – June 19: DM
June 22 – June 26: AR
July 5 – July 17: IED
July 6 – July 10: DM
July 13 – July 17: AR

San Jose State University
June 14 – June 17: GA, LTT
June 14 – June 19: DM
June 14 – June 26: CSE
June 18 – June 20: EE
June 22 – June 24: ME, LTT
June 22 – June 26: AR
June 25 – June 27: FS
July 19 – July 24: ICS
July 19 – July 31: IED, POE, DE & CSE

Cal State East Bay (Biomedical)
July 5 – July 17: PBS, HBS, MI, BI

Registration Opened: March 16
Professional Development

Cal Poly Pomona hosted 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
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
Fourth Annual PLTW State Conference
February 19–20, 2015
Sacramento, CA

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

Sessions included 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
CA STEM Conferences

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/

CA STEM Symposium
October 28-30, 2015
Anaheim
A gathering of STEM teachers, educators, administrators, business and community partners to learn and share ideas in support of STEM Education in California (with a special focus on increasing and supporting the participation of women and girls- as well as other underrepresented groups)
http://cdefoundation.org/stemsymposium/
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)
- Environmental Sustainability (science-biological)
- Engineering Design and Dev. (interdisciplinary)
All PLTW Courses are “A-G” Approved

Approved as “f”, Visual & Performing Art:
• Introduction to Design
  – (optional approval for modified version of IED)

Approved as “d”, Lab Science:
• Engineering Design and Development
  – (optional if taught by a science teacher)
• Principles of Biomedical Sciences
• Human Body Systems
• Medical Interventions
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
Implementation & Cost

Participation Fee Model

• Annual Participation Fee (includes software):
  • PLTW Launch $750
  • PLTW Gateway $750
  • PLTW Engineering $3,000
  • PLTW BMS $2,000
  • PLTW CSE $2,000
Estimated Cost to Schools

- **Launch Classroom Kits**
  - General Supply Kits: $7.50 - $380
  - VEX IQ Robotics Equipment: $120 - $365
  - iPads: $4,200 - $4,800
- **Gateway:** $5,000 - $10,000 per module
- **Engineering**
  - AE: $10,000
  - CEA: $3000
  - CIM: $20,000
  - CSE: $2,200 - $4,400
  - DE: $7,000
  - EDD: $1,500
  - ES: $5,000
  - IED: $1,000
  - POE: $10,000
- **Biomedical**
  - 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 on-going 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 Launch Implementation Timeline

Academic Year (Aug. – July)

**Year 1:**
- Attend Information Conference
- Sign District Agreement
- PLTW Lead Teacher Professional Development Model
  - Readiness Training (RT): Online
  - Lead Teacher Training (LTT): Face-to-face
  - Ongoing Training (LTT-OT): Online

**Year 2:**
- PLTW Launch Classroom Teacher Professional Development Model
  - Building Level Readiness Training (BL-RT): Face-to-face
  - Grade Level Specific Core Training (CT): Online
  - PLTW Launch Instruction Begins
  - Ongoing Training (OT): Online
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
Some Deadlines

- Summer Training Schedule Posted
  Jan/ Feb

- New District or School Signups
  March 1

- Registration for summer training
  Mar/Apr

  * Note: Readiness Training MUST be successfully completed in order to register for summer training.

- Signed Agreement (if a new District)
  May 1
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 (Females)

- 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.engineereyourlife.org  Judy Lee  Erin Fletcher  SHSE at CPP
Recruiting Techniques (Females)
Programs Implemented by Cal Poly Pomona

- Introduce a Girl to Engineering Day
- E-Girl
- Femineers
Introduce a Girl to Engineering Day

- Annual event on Cal Poly Pomona’s campus
- 100 middle school girls from local area attend
- Encourages the exploration of careers in engineering
- Hands-on activities and lab tour
Implementation & Cost

Recruiting Techniques (Females)

E-Girl

• Annual event on Cal Poly Pomona’s campus
• A part of EGR 299 service learning outreach course
• Hands-on activities
• Direct contact with successful engineering professionals and current Cal Poly Pomona engineering students
Recruiting Techniques (Females)

- **Femineers**
- Created and funded by Cal Poly Pomona College of Engineering in 2013
- Initial group - 24 female students at Fremont Academy of Engineering and Design in Pomona Unified School District
Cal Poly Pomona Female Engineering Organizations
SOCIETY OF WOMEN
ASPIRE.
ADVANCE.
ACHIEVE.
ENGINEERS
SWE Vision

Stimulate women to achieve full potential in careers as engineers and leaders, expand the image of the engineering profession as a positive force in improving the quality of life, and demonstrate the value of diversity.

For more than six decades, SWE has given women engineers a unique place and voice within the engineering industry.

Our organization is centered around a passion for our members' success and continues to evolve with the challenges and opportunities reflected in today's exciting engineering and technology specialties.
ALYSSA EMERSON

• Electrical Engineering

• SWE Freshman Representative

• 1st year

• Palmdale, CA

• I love working with other people, solving problems, and constantly facing new challenges.
OUTREACH EVENTS

ACCESS
Available to Community College Students

Girls D.R.E.A.M.
Geared towards 4th-6th graders

YES! Program
Aimed towards youth (7th-12th grade)
CAL POLY POMONA
WOMEN IN ENGINEERING
CPP WE STUDENT ASSISTANTS
WHAT WE DO
Preparing Students for the Global Economy
State and Regional Program Support
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.
PLTW Courses and College Credit

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
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 by School Year

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<th>Year</th>
<th>Number</th>
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<td>2012</td>
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PLTW Schools in CPP Service Area

Growth & Sustainability

CPP became PLTW Affiliate
CPP became PLTW Affiliate
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
Business & Industry Support

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

Chevron at Bakersfield

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.
## Engineering National Affiliates

<table>
<thead>
<tr>
<th>West Coast</th>
<th>Mountain</th>
<th>Midwest</th>
<th>Southwest</th>
<th>Northeast</th>
<th>Southeast</th>
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<tr>
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<tr>
<td><a href="#">San Diego State University</a></td>
<td><a href="#">UCCS</a></td>
<td><a href="#">Purdue University</a></td>
<td><a href="#">UT Tyler</a></td>
<td><a href="#">RIT</a></td>
<td><a href="#">College of Engineering and Computing, University of South Carolina</a></td>
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<td><a href="#">Oregon Institute of Technology</a></td>
<td><a href="#">Utah Valley University</a></td>
<td><a href="#">Sinclair Community College</a></td>
<td><a href="#">Missouri S&amp;T</a></td>
<td><a href="#">NHTI, Concord's Community College</a></td>
<td><a href="#">Old Dominion University</a></td>
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<td><a href="#">Seattle University</a></td>
<td><a href="#">UNLV</a></td>
<td><a href="#">University of Illinois Urbana-Champaign</a></td>
<td><a href="#">University of New Haven</a></td>
<td><a href="#">Penn State Berks</a></td>
<td><a href="#">Edmund T. Pratt, Jr. School of Engineering</a></td>
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<td><a href="#">Cal Poly Pomona</a></td>
<td><a href="#">University of Minnesota</a></td>
<td><a href="#">Eastern Michigan University</a></td>
<td><a href="#">University of Nebraska Lincoln</a></td>
<td><a href="#">University of Maryland, College of Engineering</a></td>
<td><a href="#">Georgia Southern University</a></td>
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<tr>
<td><a href="#">San José State University</a></td>
<td><a href="#">UNR</a></td>
<td><a href="#">Iowa State University College of Engineering</a></td>
<td><a href="#">University of Wisconsin-Madison</a></td>
<td><a href="#">University of Hawai'i College of Engineering</a></td>
<td><a href="#">West Virginia University</a></td>
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<td><a href="#">California State University, Fullerton</a></td>
<td><a href="#">University of Kansas</a></td>
<td><a href="#">The University of Iowa</a></td>
<td><a href="#">University of Kentucky College of Engineering</a></td>
<td><a href="#">University of Kentucky College of Engineering</a></td>
<td><a href="#">University of Kentucky College of Engineering</a></td>
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<td>Region</td>
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</tr>
<tr>
<td>West Coast</td>
<td>California State University East Bay, Washington State University, Washington</td>
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<tr>
<td>Midwest</td>
<td>University of Texas at Tyler, Missouri S&amp;T, IUPUI</td>
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</tr>
<tr>
<td>Southwest</td>
<td>University of Oklahoma, University of Kentucky, University of Southern California CEC</td>
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<tr>
<td>Northeast</td>
<td>Duke University, EDUCAUSE, University of Baltimore</td>
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</tr>
<tr>
<td>Southeast</td>
<td>University of Kentucky, University of Southern California CEC</td>
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</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?
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: 345.11
- All PLTW: 376.75
- GHS Hispanic: 329.64
- PLTW Hispanic: 352.25
  - Advanced: 21%, 47%
  - Proficient: 26%, 20%
  - Basic: 30%, 22%
  - Below Basic: 13%, 3%
  - Far Below: 10%, 7%

**Mathematics**
- All GHS Students: 306.96
- All PLTW: 336.63
- GHS Hispanic: 295.70
- PLTW Hispanic: 322.00
  - Advanced: 3%, 9%
  - Proficient: 16%, 35%
  - Basic: 31%, 25%
  - Below Basic: 40%, 28%
  - Far Below: 10%, 4%

**Science**
- All GHS Students: 342.66
- All PLTW: 369.33
- GHS Hispanic: 318.25
- PLTW Hispanic: 346.42
  - Advanced: 16%, 33%
  - Proficient: 29%, 31%
  - Basic: 32%, 20%
  - Below Basic: 11%, 4%
  - Far Below: 12%, 11%

**Social Science**
- All GHS Students: 361.69
- All PLTW: 422.57
- GHS Hispanic: 344.40
- PLTW Hispanic: 411.86
  - Advanced: 29%, 71%
  - Proficient: 28%, 18%
  - Basic: 22%, 4%
  - Below Basic: 9%, ---
  - Far Below: 11%, 7%
Graduation Rates

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

![Graduation Rates Chart]

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: CST Math Scores - Averages

<table>
<thead>
<tr>
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<th>9th</th>
<th>10th</th>
<th>11th</th>
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</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.
Resources
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.cpp.edu/~engineering/diversity/pltw/index.html

PLTW CA:  
www.pltwca.org

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