November 19, 2008

Project Lead The Way: Illinois Gateway to Technology (GTT)
National PLTW Overview

PLTW Mission
Create dynamic partnerships with our nation’s schools to prepare an increasing and more diverse group of students to be successful in science, engineering and engineering technology programs.
What We Believe

Rigorous, integrated, project/problem based curricula and rigorous, comprehensive professional development empower teachers.
Hands-on, real world projects make math and science relevant

(AppB)
- Activities
- Project-based learning
- Problem-based learning

Research shows APPB schools experience increases in student motivation, cognitive learning skills, higher-order thinking and student achievement.
PLTW Progress

What has happened to Project Lead The Way in 10 years?
National Program Growth

- As of May 2007 PLTW has:
  - 250,000+ students,
  - located at 2200+ school sites,
  - in 46 states & DC,
  - being taught engineering curricula,
  - by over 3500 teachers,
  - all trained by PLTW,
  - at 29 university sites.
Program Growth

Middle School - Gateway To Technology

- Design and Modeling (9 wks)
- The Magic of Electrons (9 wks)
- The Science of Technology (9 wks)
- Automation and Robotics (9 wks)
- Flight and Space (9 wks) NASA
- **Energy and Environment (9 wks)**

**in development**
Program Growth
High School - Pathway To Engineering

Foundation:
- Introduction to Engineering Design
- Principles of Engineering
- Digital Electronics

Specialization:
- Computer Integrated Manufacturing
- Civil Engineering and Architecture
- Biotechnical Engineering
- Aerospace Engineering
- Energy and Power (?)

Capstone:
- Engineering Design and Development

Note: Course program requires college prep mathematics each year.
3-Phase Professional Development

Core Training
- Summer Institute
  - Gateway To Technology (Middle School)
  - Principles of Engineering
  - Introduction To Engineering Design
  - Digital Electronics
  - Computer Integrated Manufacturing
  - Civil Engineering/Architecture
  - Biotechnical Engineering
  - Aerospace Engineering
  - Engineering Design and Development

PLTW Continuous Training
- Virtual Academy
- University Based PD
- Level II Training
- Master Teacher

Self-Assessment and Pre-Core Training
- Ready for core training
- Ready for teaching

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Summary Observations
About Course Elements
PLTW Course Resources

- Online curriculum (PLTW)
- High end computer labs/laptops for students
- High end laptop for teacher
- Autodesk software; MS Office, etc.
- Equipment/supplies/references
- Resource texts (in development)
- Access to 3-D printers and other optional equipment
Autodesk and Other Licensing

- **Annual Autodesk Software license:**
  - $3995 (for HS courses and up to 2 MS) or
  - $2,900 for first year HS Inventor/IED only, or
  - $1,000 for Middle School GTT only, or
  - Free for up to 2 Middle School feeders per HS (2008)

- **Additional software annual lease (from PLTW) for some courses:**
  - $650 per 25 seats DE (MultiSIM)
  - $2,100 per 30 seats CIM Bundles
Gateway to Technology (GTT)

- Middle School Courses
- Units: Design and Modeling, Magic of Electrons, Science of Technology, Automation and Robotics, Flight and Space
- Preferred mathematics level: Grade level 6-8 Math
- Software/Hardware Needed: Autodesk Inventor, MDSolids, Fischertechnicks, RoboPro
- Estimated Equipment/textbook/supply cost:
  - Design and Modeling $500 (required)
  - Magic of Electrons $3000
  - Science of Tech $2500
  - Automation and Robotics $6000 (required)

*excludes computer lab/network/furniture/projection equipment, annual software license fees, teacher laptop, and teacher Summer Training Institute registration ($2200) and housing/travel ($1000-1500 estimate)

*costs per class section; some materials can be used for multiple sections
Design & Modeling
The Magic of Electrons
The Science of Technology
Automation and Robotics
Gateway to Technology

Modules

Design and Modeling
- Intro to Technology
- Design Process
- Sketching Views
- 3D Computer Modeling
- Prototype Fabrication

Automation and Robotics
- Robots in Today’s World
- Mechanical Gears and Energy Transfer
- Fischertechnik Parts and Programming

Magic of Electrons
- Science of Electricity
- Electromotive Force
- Circuit Design and Fabrication
- Digital Electronics

Science of Technology
- Mechanics of Motion
- Energy Conversion Systems
- Prototyping and Fabrication

Flight and Space
- Evolution of Flight
- Airfoil Research, Construction, Testing
- Propulsion Systems
- Aeronautics and Rocketry
Science Standards

- Matrices for each GTT unit:
  - NSES Science standards
    - Unifying Concepts—all GTT units address in some manner
    - B-Physical sciences—Automation and Robotics, Science of Technology, Magic of Electrons
    - C-Life Science—none of the GTT units address
    - D-Earth and Space Science—Flight and Space has special focus(level 2 GTT unit)
    - F-Science in Personal and Social Perspectives—Design and Modeling, Science of Technology, Magic of Electrons
    - G-History and Nature of Science—Design and Modeling, Science of Technology
Science Standards, continued

- Illinois Goals and Learning Standards for Science:
  - 11B. Know and apply the concepts, principles and processes of technological design.
    - The basis for all major projects in every GTT unit
  - 12C. Know and apply concepts that describe properties of matter and energy and the interactions between them.
    - Science of Technology; Automation/Robotics; Magic of Electrons
  - 12D. Know and apply concepts that describe force and motion and the principles that explain them.
    - Design and Modeling; Science of Technology; Automation/Robotics
  - 13B. Know and apply concepts that describe the interaction between science, technology and society.
    - Emphasized in Design and Modeling; addressed in Science of Technology; Automation/Robotics
Math Standards

Matrices for each GTT unit:

- NCTM Math standards (similar to Illinois):
  - Design and Modeling (Geometry, measurement, representation, problem-solving, communication, connections)
  - Automation and Robotics (Number operations, geometry, measurement, problem-solving, communication, connections, representation)
  - Magic of Electrons (Number operations, algebra, measurement, problem-solving, reasoning/proof, connections, representation)
  - Science of Technology (Number operations, algebra, geometry, measurement, problem-solving, communication, connections, representation)
Illinois and National Learning Standards References

- [http://www.isbe.state.il.us/ils/science/standards.htm](http://www.isbe.state.il.us/ils/science/standards.htm)
- [http://www.isbe.state.il.us/ils/math/standards.htm](http://www.isbe.state.il.us/ils/math/standards.htm)
Illinois PLTW
2007-2008 Snapshot
2008-2009 Snapshot
The Numbers Tell (Part of) The Story
2007-08 Illinois PLTW Middle School GTT Enrollment

6 GTT schools:

- 2076 student GTT unit enrollments
  - 927 6th graders; 756 7th graders; 1167 8th graders

- Includes school year quarterly units, after school, and summer camp formats
  - Design and Modeling—1420 (657 6th; 210 7th; 553 8th)
  - Magic of Electons—313 (98 7th; 215 8th)
  - Science of Technology—928 (220; 449; 210 8th; 50?)
  - Automation/Robotics—289 (50 6th; 189 8th; 50?)
  - Flight/Space— 50 (50 8th)
2008-09 Illinois PLTW Middle School GTT Enrollment

- 10 GTT schools: (9 of 10 reporting)
  - 3576 student GTT unit enrollments
    - 950 6th graders; 1063 7th graders; 1563 8th graders
  - Includes school year quarterly units, after school, and summer camp formats
    - Design and Modeling—1986 (664 6th; 425 7th; 897 8th)
    - Magic of Electons—340 (70 7th; 270 8th)
    - Science of Technology—1074 (286 6th; 568 7th; 220 8th)
    - Automation/Robotics—126 (126 8th)
    - Flight/Space— 50 (50 8th)
Illinois Business/Community Partnerships are Essential to Success

Moline High School PLTW involves John Deere executives and retirees in partnership activities
Illinois Business/Community Partnerships are Essential to Success

- Local business support
- Parent/family/general community support
- School districts, community colleges, career-to-work systems
- Autodesk - Illinois and regional reps work directly with schools and Illinois PLTW leaders to coordinate training sessions and communication systems
Sources of Funding Support

- Illinois Department of Commerce and Economic Opportunity
- Kern Family Foundation
- Education for Employment (EFE) Regions
- Local School Districts
- Local and Regional Businesses
Illinois Student Success

- Female and Minority participation
- Teamwork, communication
- Integrated STEM education
- Hands-on Problem Solving
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