November 19, 2008

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

UNIVERSITY OF ILLINOIS

CHICAGO • SPRINGFIELD • URBANA-CHAMPAIGN

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.

PLTW Curriculum Philosophy

- 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

and/or **Civil Engineering and Architecture**

and/or **Biotechnical Engineering**

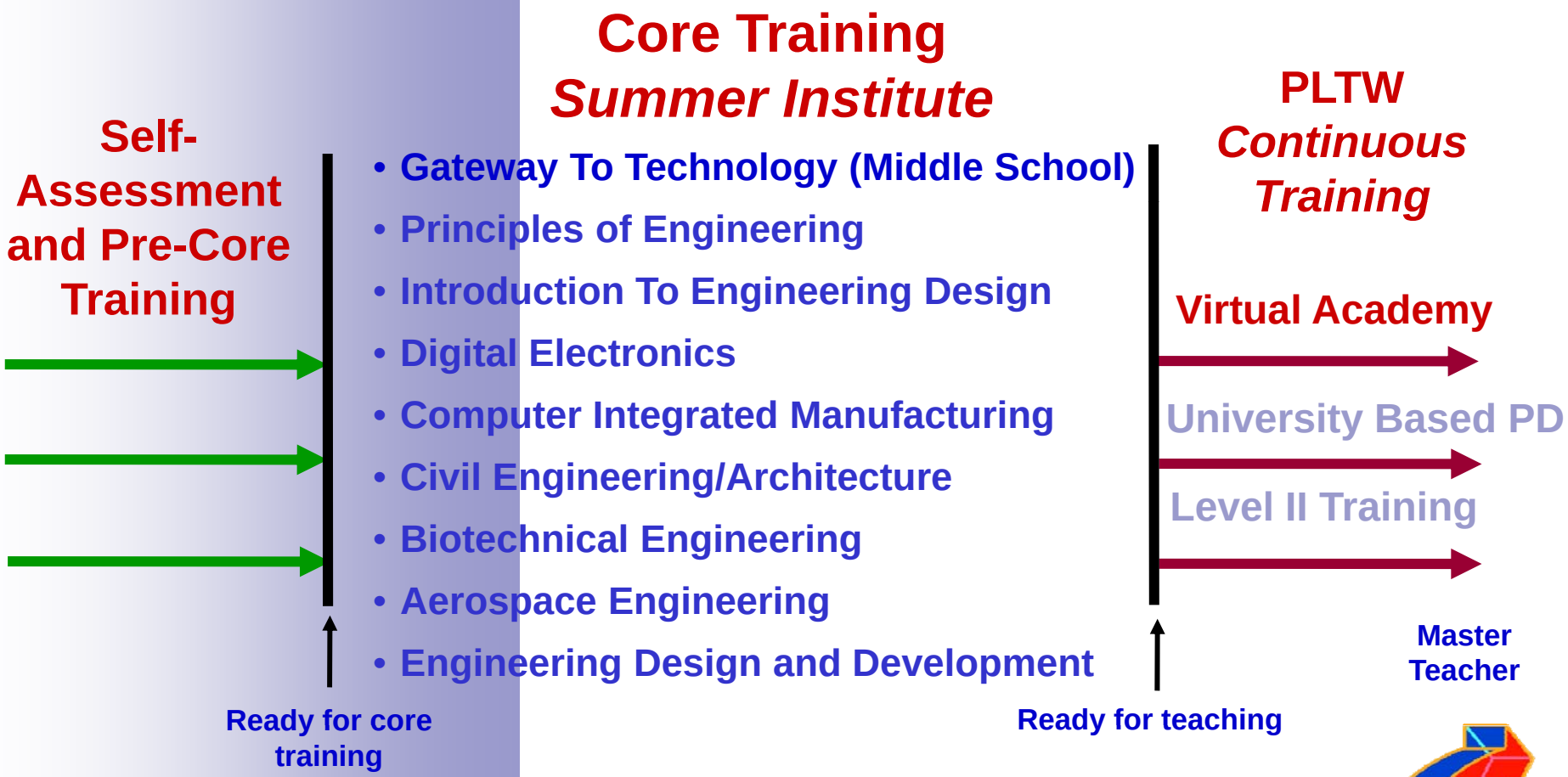
and/or **Aerospace Engineering**

and/or **Energy and Power (?)**

Capstone: **Engineering Design and Development**

Note: Course program requires college prep mathematics each year.

3-Phase Professional Development



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

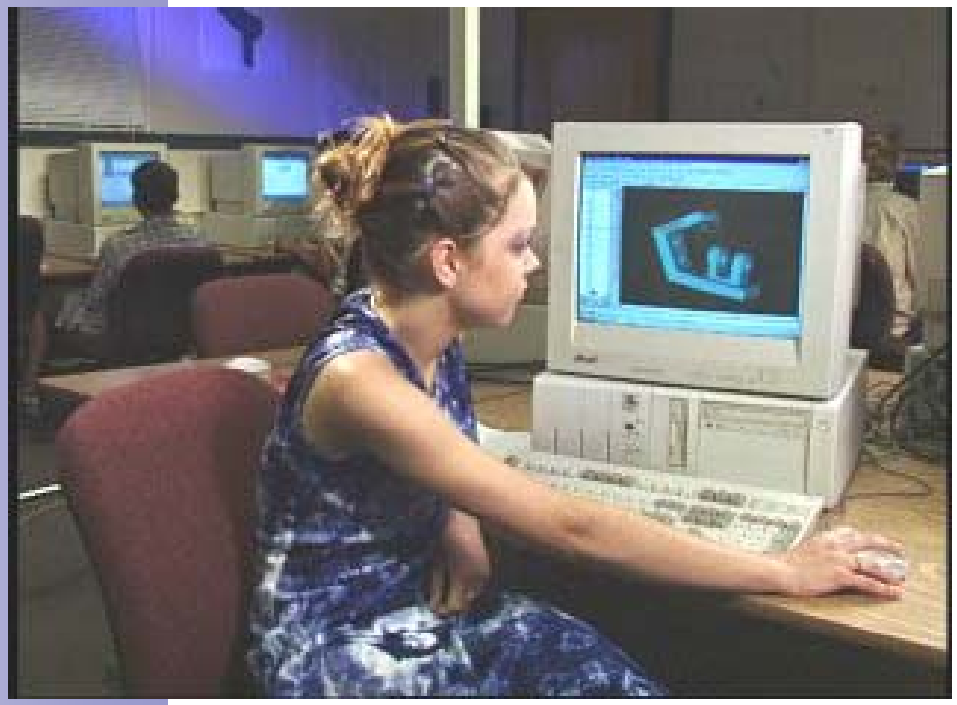
Gateway to Technology (GTT)

- 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



Gateway To Technology®
www.pltw.org

The Magic of Electrons

Gateway To Technology®
www.pltw.org

The Science of Technology

Gateway To Technology®
www.pltw.org

Automation and Robotics

Gateway To Technology®
www.pltw.org

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
    - A-Science as Inquiry—Design and Modeling, Science of Technology, Magic of Electrons
    - 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)
    - E-Science and Technology—Design and Modeling, Automation and Robotics, Science of Technology, Magic of Electrons
    - 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/math/standards.htm

- Http://www.nsta.org/publications/nses.aspx
- http://standards.nctm.org/document/chapter6/index.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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