The United States graduates... one engineer to every 10 lawyers

China graduates... 10 engineers to every lawyer.

- Europe graduates 3X as many Engineering students as US
- Asia: 5X as many
Some Facts to Ponder...

- Only 18 percent of American high school students were proficient in science in 2000.

- Approximately 25 percent of all freshmen engineering students need remedial math.

- By the time U.S. students reach their senior year of high school, they rank below their counterparts in 17 other countries in math and science literacy.
Some Facts to Ponder...

- Of those who enter engineering school, fewer than 40 percent complete the degree programs.

- Bachelor degrees in engineering in 2001 were 65,195 down from 71,386 in 1988, an 8.6 percent drop.

- In 2000, 38% of U.S. jobs requiring a PhD in science or technology were filled by people who were born abroad.
There are more E/ET jobs in U.S. than trained people to fill them.


By 2010, half of all baby boomers will be gone from workforce. By 2020, the other half will be retired.

Provide technology-oriented careers

Provide information & education early in a student’s life.

Provide hands-on education in engineering-related disciplines
The primary goal of PLTW is to grow the nation's technology workforce.
Partnership Model

Mission

Create dynamic partnerships with our nation’s schools to prepare an increasing & more diverse group of students for success in Science, Engineering & Engineering Technology.
States Participating in PLTW 2006-07

46 States & DC • 1700 School Sites • Derby, England
PLTW Curriculum Program

Pre-Engineering:

Middle School: Gateway To Technology
(5 units available)

High School: Pathway to Engineering
(8 courses available)

Biomedical Sciences:

High School: Biomedical Sciences
(4 courses to be field tested)
Middle School Program: Gateway to Technology

- Design and Modeling
- The Magic of Electrons
- The Science of Technology
- Automation and Robotics
- Flight and Space - developed with NASA

UNDER DEVELOPMENT:
- Technology in Motion (Energy)

Implementation Options:
- GTT Basic - Implement Design & Automation Unit
- GTT advanced - Implement at least 4 units including Design & Automation

9-10 week units
HS Program: Pathway to Engineering

Foundation Courses
- IED: Introduction to Engineering Design (DDP in NYS)
- DE: Digital Electronics
- POE: Principles of Engineering

Specialization Course (HS offers 1 or more):
- CIM: Computer Integrated Manufacturing
- CEA: Civil Engineering/Architecture
- BE: Biotechnical Engineering
- AE: Aerospace Engineering

Capstone Course:
- EDD: Engineering Design & Development
## PLTW Math & Science Connections

<table>
<thead>
<tr>
<th>IED</th>
<th>CIM</th>
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</thead>
<tbody>
<tr>
<td><strong>Algebra I &amp; II</strong></td>
<td><strong>Students apply IED concepts</strong></td>
</tr>
<tr>
<td><strong>Cartesian coordinate system, geometric terms &amp; relationships</strong></td>
<td><strong>Algebra I &amp; II</strong></td>
</tr>
<tr>
<td><strong>NYS Math A</strong></td>
<td><strong>Geometry</strong></td>
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<table>
<thead>
<tr>
<th>DE</th>
<th>Specialized Courses</th>
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<tbody>
<tr>
<td><strong>Students need to be logical thinkers</strong></td>
<td><strong>Algebra I &amp; II</strong></td>
</tr>
<tr>
<td><strong>Need understanding of Boolean Logic (on Math A and Math B regents exam)</strong></td>
<td><strong>Geometry</strong></td>
</tr>
<tr>
<td><strong>Physics (electricity) &amp; Chemistry (atoms)</strong></td>
<td><strong>Trigonometry</strong></td>
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</table>

<table>
<thead>
<tr>
<th>POE</th>
<th>EDD</th>
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</thead>
<tbody>
<tr>
<td><strong>Algebra I (Math A)</strong></td>
<td><strong>Trigonometry</strong></td>
</tr>
<tr>
<td><strong>Trigonometry</strong></td>
<td><strong>Pre-Calculus</strong></td>
</tr>
<tr>
<td><strong>Statistic concepts</strong></td>
<td><strong>Calculus</strong></td>
</tr>
<tr>
<td><strong>Physics</strong></td>
<td></td>
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<tr>
<td><strong>Chemistry</strong></td>
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</table>
Future Pathway to Biomedical Sciences

Foundation Courses
- Principles of Biomedical Science (Field test 2007-08, avail in Fall 2008)
- Human Systems (Field test 2008-09, avail in Fall 2009)
- Medical Interventions (Field test 2009-10, avail in Fall 2010)

Specialization Course
- Biotechnical Engineering
- TBA

Capstone Course:
- Scientific Research (Field test 2010-2011, avail in Fall 2011)

Funded by: Connecticut, Indiana, Maryland, Missouri, Oklahoma, South Carolina
Who should take PLTW courses?
Possible Characteristics of Prospective PLTW Students.....

- Maintains at least 75% grade in math & science
- Expresses desire to be an engineer or technologist
- Enjoys working with computers
- Enjoys putting things together
- Knows how things work
- Works well in a team
- Expresses self clearly (verbal & written)
- Displays aptitude for art & design concepts
- Solves problems easily
- Inquisitive
Engineering as a launching pad for other professions:

- Engineers become patent attorneys
- Biomedical engineers have the highest acceptance rate into medical school
- More engineers are CEO’s of companies than any other major
- Many become financial analysts on Wall Street
- Many go into politics
- Many become teachers or writers
Commitments

- From PLTW
- From School/District
1. MS &/or HS Curriculum
2. Teacher Training
3. Continuous Training
4. Counselor Conferences
5. Systematic Evaluation
6. Financial Support
7. Course Credit

PLTW Commitments

Grad credit for teachers
College credit for students
State Aid for Training

True Outcomes

Dates posted on website

• Virtual Academy
• Listserv & mentors
Attributes of PLTW Curricula

- Is contextual project/problem based
- 1/3 theory, 2/3 application
- Highly rigorous & relevant
- Integrates national MST and ELA learning standards
- Prepares students for successful transition for 2-4 year college programs
PLTW Professional Development

2007 Summer Institute Training (STI)

10 days of instruction for each course

Self-Assessment and Pre-STI Training

- Gateway To Technology
- IED-Design & Drawing for Production
- Digital Electronics
- Principles of Engineering
- Computer Integrated Manufacturing
- Civil Engineering/Architecture
- Biotechnical Engineering
- Aerospace Engineering
- Engineering Design and Development

Univ. Based PD

Level II Training

Virtual Academy

Ready for core training

Ready for teaching
School District Agreement Components

- Implement PLTW course curriculum over 4 years and/or Implement Gateway To Technology

- Agree to become certified within 2 years
  - Support teachers in training program (provide laptop)
  - Counselors participate in training
  - Provide teachers with specified labs, with equipment and updated software
  - Form a teacher-led partnership team

- Participate in evaluation of PLTW

- Commit to on-going training opportunities
Recognition & Research
Findings
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.”
Project Lead The Way is recognized by the Bayer Science Foundation as a K-12 Best practices STEM Education Program. 2006
80% of seniors plan on attending college or community college compared to 65% nationwide.

54% plan to enroll in engineering or engineering technology compared to 10% nationally.

19% plan on attending community college or Technical School.

85% student retention rate in 2nd year of E/ET compared to 40% nationwide.
Female student participation in PLTW courses (17%) exceeds or is comparable to the fields of Mechanical (13.7%), Electrical (15%) and Computer Engineering (12.1%), and in Engineering Technology (11.7%).

The engineering disciplines which attract more female enrollment are those which intersect with life sciences (Environmental 41%, Agricultural 37%, Biomedical 46%).
Southern Regional Ed. Board H.S. That Work

When PLTW students were compared to similar students in career/tech fields, PLTW students:

✓ Had significantly > achievement in mathematics on National Assessment of Ed. Progress assessments

✓ Had significantly > achievement in reading, math, and science on NAEP reference assessments

✓ Completed significantly more high level math and science courses
University Role
RIT’s Partnership with PLTW...

- **1996** - RIT first university to partner with PLTW for training, still largest training site

- **2006** - RIT hosted 265 teachers from 166 schools in 28 states, 4 weeks of training, half were from NYS

- **Within 2005-06 school year** - 1,333 students were awarded transcripted RIT credit
STI 2006 Training Locations

24 University Training Sites
A HS student who attends a certified PLTW school may be eligible for RIT college credit for the following courses...

- Introduction to Engineering Design (IED/DDP)
- Digital Electronics
- Principles of Engineering
- Computer Integrated Manufacturing
- Civil Engineering/Architecture
- Aerospace Engineering
- Biotechnical Engineering

$200 for each course
$2,012 for undergraduate courses
Earning College Credit...

- HS student earns an 85% course average
- Student passes college credit exam with A (90+), B (80+), or C (70+)
- Student registers for 4 quarter credits
- RIT sends grade report & maintains transcript
- Students apply for credit in the same calendar year in which RIT exam was taken
Using the College Credits...

- Transcripted credits may transfer to other institutions.
- Each university & academic program establishes its own policies on accepting transfer credit.
- HS students with college credits stand out in the admission process.
Graduate College Credit

- Teachers may earn 6 RIT quarter credits for each PLTW course
- 80 hour summer training plus exam and/or project
- Tuition for each college credit course = $900

(Regular RIT Graduate Tuition is $4,278 per course)
Next Steps for Districts
<table>
<thead>
<tr>
<th>Next Steps...</th>
<th>Fall and/or Spring</th>
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<tbody>
<tr>
<td><strong>Between 9/1-3/15</strong></td>
<td><strong>By March 15</strong></td>
</tr>
<tr>
<td>➢ Research PLTW opportunities</td>
<td>➢ Districts, buildings, and teachers register on website</td>
</tr>
<tr>
<td>➢ Schedule visitations</td>
<td><strong>By May 31</strong></td>
</tr>
<tr>
<td>➢ Promote in district to BOE, teachers, parents, students</td>
<td>➢ Submit School Agreement</td>
</tr>
<tr>
<td>➢ Determine courses to be offered</td>
<td><strong>By June</strong></td>
</tr>
<tr>
<td>➢ Review equipment &amp; supplies (item analysis)</td>
<td>➢ Teachers register for Summer Training Institute</td>
</tr>
<tr>
<td>➢ Develop 4 year budget plan</td>
<td><strong>July</strong></td>
</tr>
<tr>
<td></td>
<td>➢ Teachers attend Summer Training</td>
</tr>
</tbody>
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Resources for Schools
“Forging New Generation of Engineers”

- Comprehensive overview
- Contains information on most aspects of the program
- Available in two forms

Four-Fold Intended Audience:
- Parents
- Counselors
- General Public

Booklet & PDF Intended Audience:
- Superintendents
- Boards of Education
- Colleges/Universities
- Business Leaders
Guiding Students to Success
A Resource Guide for School Counselors

Counselors Kit
Includes everything a school counselor needs to guide students and parents, including posters.
“Talented Girls Bright Futures”

- An introduction to science, technology and engineering careers for your daughters.

**Booklet & PDF**

**Intended Audience:**
- Superintendents
- Boards of Education
- Colleges/Universities
- Business Leaders
- Counselors
- Parents
Aerospace Engineering focuses on engineering that relates to anything that moves or flies through the air.

Biomedical & Biotechnical Engineering is geared towards coming up with new ways to improve the quality of our lives.

Intended Audience: Parents, Students, School Counselors
Go to PLTW website to learn conference details
RIT's PLTW – Web Site
www.rit.edu/~pltw