IMPROVING LEARNING AND OUTCOMES IN TECHNOLOGY AND PRE-ENGINEERING EDUCATION:

A GUIDEBOOK FOR LOCAL LEADERSHIP TEAMS

February 2007
ACKNOWLEDGEMENTS

Several groups, individuals and organizations provided invaluable insights in the planning and implementation of the Early Evaluation Design Study and the preparation of this report. Members of the Evaluation Design Workgroup assisted in outlining an evaluation framework for pre-engineering and technology education programs and reviewing early drafts of data profiles and project publications. The Evaluation Design Workgroup included: Dr. Margaret Ellibee, Mr. Brent Kindred, Ms. Denise Roseland, and Mr. Brian Wilmot from the Wisconsin Department of Public Instruction; Mr. James Mackey and Ms. Aleta Murray from the Wisconsin Technical College System office; Dr. John Farrow from the Milwaukee School of Engineering; Mr. Pat Leaveck from Project Lead the Way; Ms. Lauren Baker and Ms. Susan Lunsford from the Milwaukee Public Schools; Dr. Mike Ptacek; and Mr. Greg Quam, Platteville Public Schools.

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The PLTW leadership teams in the four high schools and two middle schools agreed to serve as our field sites for collecting, reporting, and critiquing evaluative information on PLTW students, the program, and its interface with other secondary school curriculum improvement initiatives. In exchange for access to their schools, classrooms, and local data sources, we agreed to keep their identity confidential. Throughout the 2005-06 school year each of these teams (instructors, guidance counselors, building administrators, and data analysts) met with the researchers on multiple occasions to discuss the critical evaluation and assessment questions, and to identify the data needed to address an array of program improvement and accountability challenges. Their candid reactions and comments were most helpful in designing and producing both this report and the Guidebook for Local Teams.

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Several members of the CEW staff were instrumental in bringing the project to a successful conclusion. Ms. Christine Olson designed and produced each of the publications and the research brief. Ms. Joyce Shepard handled the logistics of meetings, travel, and document editing. Dr. Scott Solberg, Dr. James Frasier and Mr. John Gugerty reviewed early drafts of the publications and offered valuable comments and critiques.

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TABLE OF CONTENTS

4 INTRODUCTION
4 Why does Engineering and Technology Education Matter?
5 What role does STEM education play in increasing student engagement, achievement, and post-high school success?
11 Are STEM and PLTW Initiatives Working: Tools and Resources for Decision-Making?

15 THE PROGRESS AND PERFORMANCE PROFILE
15 Organization
15 Profile Indicator Descriptions

16 SCHOOL AND COMMUNITY CONTEXT
Guiding Questions 16
Indicators 16
Reflection Questions 18
Observations and Action Recommendations 19

22 PROGRAM IMPLEMENTATION
Guiding Questions 22
Indicators 22
Reflection Questions 28
Observations and Action Recommendations 29

31 STUDENT AND SCHOOL OUTCOMES
Guiding Questions 31
Indicators 32
Reflection Questions 39
Observations and Action Recommendations 40

42 POST-SCHOOL OUTCOMES
Guiding Questions 42
Indicators 42
Reflection Questions 45
Observations and Action Recommendations 46

48 REFERENCES

49 APPENDICES
49 A. Eleven Guiding Questions
50 B. Focus Group Questions
52 C. Reflective Questions
54 D. High School Survey of Student Engagement Instrument
INTRODUCTION

This Guidebook is about documenting and improving the quality and impact of technology and pre-engineering programs. It offers strategies and resources for strengthening a pre-engineering program receiving national attention—*Project Lead the Way*. In 2007 more than 100 Wisconsin middle schools and high schools were implementing the science, engineering and technology focused modules or courses. The approach and tools described herein are used in schools, colleges, businesses and non-profit organizations committed to continuous performance improvement using frequent and ongoing assessment. Designed in collaboration with teams of local educators, this program improvement and accountability process is designed to *add value* to teaching and learning experiences for students, educators, and other stakeholders (such as business, industry, and postsecondary education partners and parents) by systematically collecting and using assessment and outcome data which provide for informed decision-making by everyone.

*Project Lead the Way* is a technology education and pre-engineering program offered in more than 1,300 middle and high schools in 45 states. Taken in conjunction with a college preparation course of studies, PLTW courses use project- and problem-based learning experiences that allow students to apply knowledge to real-world problems and situations. More specifically, the standards-aligned courses provide opportunities for students to:

- understand the scientific process, engineering problem-solving, and the application of technology;
- understand how technological systems work with other systems;
- use mathematics knowledge and skills in solving problems;
- communicate effectively through reading, writing, listening, and speaking; and
- work effectively with others.

Figure 3 provides an overview of the PLTW curriculum framework and courses, including the Gateway to Technology modules for middle schools. Recent studies of high schools implementing PLTW show that enrollment is associated with high levels of achievement in senior year assessments of reading, science and mathematics (Bottoms & Anthony, 2005) and high levels of student engagement (Phelps & Alder, 2007). Current details about the PLTW initiative and organization can be found at www.pltw.org.

Why does Engineering and Technology Education Matter?

Through 2014, science, technology, and engineering job openings in Wisconsin will increase by 18.3% compared to an 11.5% growth rate for all other occupations (Camfield & Barroilhet, 2006). Of these 13,800 annual openings in science and engineering careers, more than 70 percent (71.2%) will require a 2-year or 4-year college degree or certificate, according to the Department of Workforce Development. Approximately 32,000 bachelor’s degrees are awarded each year in Wisconsin, but only 21% of the degrees awarded by the UW System campuses over the past five years are in the fast growing science, technology, and engineering fields. In 2004, 32% of U.S. undergraduates received their degrees in science and engineering. In Germany, China, and Japan, the corresponding figures were: 36%, 59%, and 66% respectively (Rising above the gathering storm: Energizing and employing America for a brighter economic future, 2005).

In 2004-05, the University of Wisconsin System campuses, the Technical Colleges, and the private institutions awarded two- and four-year degrees to approximately 6,300 individuals preparing for careers in the rapidly growing science, technology, engineering, and mathematics (STEM) fields.
Thus, while Wisconsin’s science and engineering workplaces are currently creating 9,800 openings each year requiring an associate or bachelors degree less than 6,400 degrees or certificates are awarded each year in these fields by Wisconsin’s higher education institutions. Wisconsin’s present STEM workforce preparation GAP is at least 3,400 college graduates each year, and likely to rise substantially as the 14-17 age youth population declines by 11% over the next decade.

Preparing all students to leave high school equipped to succeed in college and high-wage career paths is a critical public policy goal for education reform and economic development initiatives at the national and state level. Achieve, Inc.—a non-profit organization formed in 1996 by the nation’s governors and business leaders—argues that... far too many young people leave our schools without the skills they need to compete in college or the workplace (Achieve, 2006).

The most recent educational pipeline data (compiled in 2002) indicate that for every 100 students who enter the 9th grade in Wisconsin high schools:

- 79 graduated from high school on time
- 47 entered college immediately
- 34 returned for their sophomore year, and
- 25 graduated with an associate degree within 3 years or a bachelor’s degree in 6 years (The educational pipeline: Big investments, big returns, 2004).

While Wisconsin schools and colleges have been highly successful over the past several decades, the Wisconsin Technology Council’s Vision 2020 report (Vision 2020: A model Wisconsin economy, 2002) outlines the challenges that are ahead.

- With a culture and business climate much like our own, Minnesota’s per capita income ($33,101) is well above the U.S. average ($30,472); the income gap between Minnesota and Wisconsin is nearly $4,000 per person and widening.
- Wisconsin needs 150,000 more college graduates to meet the U.S. per capita income average... and another 150,000 workers with post-graduate degrees to exceed the U.S. per capita income average.

What Role does STEM Education Play in Increasing Student Engagement, Achievement, and Post-High School Success?

To address the rapidly rising crisis in America’s global economic competitiveness, a distinguished National Academy of Science Commission’s principal recommendation is to: Increase America’s talent pool by vastly improving K–12 science and mathematics education (Rising above the gathering storm: Energizing and employing America for a brighter economic future, 2005). Action steps for addressing this recommendation include strengthening the skills and knowledge of math and science teachers through intensive professional development (summer institutes and master’s degree programs), and identifying and using K-12 curriculum materials that are aligned with world-class standards. The PLTW curriculum and courses are cited as a model for implementing this recommendation by the National Academy of Science Commission.

Pre-engineering and technology education curricula can be helpful in addressing two major challenges that high school educators must confront: deepening student engagement in learning, and raising student achievement.

In four Wisconsin high schools implementing PLTW courses, students were asked in May 2006 to complete the High School Survey of Student Engagement, a short assessment asking students to evaluate their recent school experiences. Compared to a smaller sample of non-PLTW students from the same high schools and a national sample of more than 80,000 high school peers, students completing PLTW courses appear to have higher levels of engagement. Compared to non-PLTW students, those completing PLTW courses are 12-20% more likely to say they had grown quite a bit or very much in the seven inter-personal, developmental, and technical skill areas listed in Figure 1.
Raising the academic achievement for all high school students has become a national imperative and a core benchmark for assessing high school redesign efforts. A recently published, rigorous analysis of student achievement in high school PLTW courses, conducted by the Southern Regional Education Board (Bottoms & Anthony, 2005), revealed some promising results. When compared to similar students enrolling in a concentration of career and technical education courses, 275 PLTW students who completed two or more PLTW courses scored significantly higher in reading, mathematics, and science on an assessment taken in the senior year which was similar to the National Assessment of Education Progress (NAEP). (See Figure 2.)

Additionally, the authors noted these students had completed more mathematics and science courses, and reported being enrolled in classes in which real world problems and group work was used to learn mathematics and science content. These results suggest clearly that PLTW and similar technology education courses offer the opportunity to raise the academic learning outcomes for a wide range of diverse students, who, in many cases, might not consider pursuing higher or postsecondary education.

Considering the broader education landscape, America’s high schools have been a rapidly rising priority in the nation’s education reform debates over the past five years. National organizations (including the National Governors Association and the Education Commission of the States) and state education agencies (including the Wisconsin State Superintendent of Public Instruction) have taken clear positions arguing that the comprehensive high school must be transformed into smaller learning communities which engage students and teachers deeply in acquiring knowledge and skills for the 21st century.

The National High School Alliance—a partnership of nearly 50 organizations and associations—serves as a catalyst for advancing the excellence, equity and development of the nation’s high school youth. In April 2005, the NHSA issued a wide-cited and acclaimed
publication entitled: *Call to Action: Transforming High School for All Youth*. A diverse collection of organizations, including the College Board, the National League of Cities, the National Education Association, and the Chicago Community Trust, have embraced six core principles for ensuring that all students are ready for college, careers, and active civic participation. The six principles for high school transformation and innovation include: Academic engagement for all students; Personalized learning environments; Empowered educators; Accountable leaders; Engaged community and youth; and Integrated system of high standards, curriculum, instruction, assessments, and supports.

A similar and equally important call for strengthening middle schools has emerged. In 2005, the National Association of Secondary School Principals (NASSP) released a report entitled *Breaking Ranks in the Middle: Strategies for Leading Middle Level Reform*. Arguing that middle schools are often overlooked and the subject of too many debates about busing schedules and grade configurations, the NASSP says that the new middle school must “…address the intellectual and developmental needs of each student.” *Breaking Ranks in the Middle* offers 30 recommendations for building collaborative learning teams, personalizing the school environment, and aligning curriculum, instruction, and assessment. Several recommendations align closely with the goals and teaching approaches used in the Gateway to Technology instructional units.

Acknowledging the growing national challenges confronting high schools, Wisconsin State Superintendent Elizabeth Burmaster commissioned a 70-member High School Task Force in 2005 to identify strategies for raising achievement, closing the gap, and promoting postsecondary success and good citizenship for all students. Released in September, 2006 following a year-long analysis of systemic issues and promising practices in the high school setting, this report provides four major recommendations and several strategies.

Described below are the key design features of high quality engineering curricula and the specific supporting recommendations from the National High School Alliance’s *Call to Action*, the National Association of Secondary School Principal’s *Breaking Ranks in the Middle*, and the Wisconsin State Superintendent’s *High School Task Force Report*. The numbers and letters in parentheses identify the specific supporting recommendations and school improvement strategies found in each report.
An Integrated Curriculum

**PLTW Design Feature:** Course curricula that contain key concepts that extend and integrate students’ academic and technical knowledge

**SECONDARY SCHOOL REDESIGN RECOMMENDATIONS**

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<tr>
<td>Engage all students in a rigorous, standards-based core academic curriculum (B1)</td>
<td>Each school will identify a set of essential learnings—in literature and language, writing, mathematics, social studies, science, and the arts—in which students must demonstrate achievement in order to advance to the next level. (19)</td>
<td>Promote instructional practice that includes problem-solving and creativity and prepares students to solve real-world problems and participate as citizens in a diverse and multi-cultural world. (B3)</td>
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<td>Emphasize project-based learning and other engaging, inquiry based teaching methods that provide opportunities for students to master academic content, learn workforce skills, and develop personal strengths (B2)</td>
<td>The content of the curriculum, where practical, will connect to real-life applications of knowledge and skills, and will extend beyond the school campus to help students link their education to the future and to the community. (22)</td>
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<td>Connect curriculum to real-world contexts that build upon student and community resources (B5)</td>
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## Teacher Professional Development

**PLTW Design Feature:** Teachers participate in a two-week Summer Institute for each course they plan to teach. The Institute includes a pre-assessment of each teacher’s mathematic proficiency. In addition to preparing teachers to provide content instruction, the institutes enhance proficiency in project-based teaching, engaging students in problems requiring rigorous mathematics and science knowledge and skills, and assessing students’ mastery of material.

### SECONDARY SCHOOL REDESIGN RECOMMENDATIONS

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<td>Utilize communities of practice as a mechanism for transforming the way educators are prepared, inducted, and retained (C5)</td>
<td>Teachers will design high-quality work and teach in ways that engage students, cause them to persist, and, when the work is successfully completed, result in student satisfaction and acquisition of knowledge, critical-thinking and problem solving skills, and other abilities. (24)</td>
<td>Promote instructional practice that includes problem-solving and creativity and prepares students to solve real-world problems and participate as citizens in a diverse and multi-cultural world. (B3)</td>
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<td>Develop and utilize multiple assessments, including performance-based measures (e.g., portfolios, public exhibitions, capstone projects), that align with standards (F2)</td>
<td>Teachers will know and be able to use a variety of strategies and settings that identify and accommodate individual learning needs and engage students. (25)</td>
<td>Provide professional development for educators in the use of multiple assessments, including assessment tools that incorporate hands-on demonstration of knowledge and skills. (B4)</td>
</tr>
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<td>Plan intended outcomes and assessment strategies before initiating a learning activity or project (F3)</td>
<td>Each teacher will have a broad base of academic knowledge, with depth in at least one subject area. (26)</td>
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<td>Teachers will be adept at acting as coaches and facilitators to promote more active involvement of students in their own learning. (27)</td>
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<td></td>
<td>Teachers will integrate assessment into instruction so that assessment is accomplished using a variety of methods that do not merely measure students but become part of the learning process (28)</td>
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### Continuous Assessment

**PLTW Design Feature:** End-of-course exams that teachers use to determine whether students have mastered key course concepts. The end-of-course assessments include traditional and constructed response items. For some affiliated universities and 2-year colleges, the assessments document the extent of college credit to be awarded when students enroll.

### SECONDARY SCHOOL REDESIGN RECOMMENDATIONS

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<tr>
<td>Develop and utilize multiple assessments, including performance-based measures (e.g., portfolios, public exhibitions, capstone projects), that align with standards (F2)</td>
<td>Teachers will integrate assessment into instruction so that assessment is accomplished using a variety of methods that do not merely measure students but become part of the learning process. (28)</td>
<td>Promote credit-based work experiences, school-business partnerships, and school-to-work opportunities to link 9-12 with post-high school education and employer workforce needs. (D2)</td>
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### Local Partnerships

**PLTW Design Feature:** PLTW certified high schools maintain a Local Partnership team. This team creates community support for the technology program, links the school and community, provides additional resources to students and teachers, and opens pathways for students to career opportunities and further education, and provides professional development resources for educators.

### SECONDARY SCHOOL REDESIGN RECOMMENDATIONS

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<tr>
<td>Engage state, district, school, community, youth, and municipal leaders in articulating a shared vision for all high-school-age youth and in defining accountability at each level. (D1)</td>
<td>Schools will build partnerships with institutions of higher education to provide teachers and administrators at both levels with ideas and opportunities to enhance the education, performance, and evaluation of educators. (7)</td>
<td>Encourage collaboration within the entire education community, including schools, colleges, universities, and technical colleges, to design and deliver programs to meet individual student learning needs and expand course offerings. (A1)</td>
</tr>
<tr>
<td>Commit community resources and establish partnerships with the school and district to support this vision. (E2)</td>
<td>Schools will develop political and financial relationships with individuals, organizations, and businesses to support and supplement educational programs and policies. (8)</td>
<td>Use collaborative partnerships among schools, businesses, &amp; community-based organizations to ease the strain of funding limitations. Involve business members in classroom activities and students in workplace sites. (D1)</td>
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Focusing on Personalized and Equitable Learning

**PLTW Design Feature:** Mandatory professional development for guidance counselors focusing on workforce needs in engineering and technology careers. Counselors from certified schools must participate every three years. PLTW strategic priorities focus on improving the participation and success of female and minority students in engineering and engineering technology programs.

### SECONDARY SCHOOL REDESIGN RECOMMENDATIONS

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<td>Assess the impact of any reform or policy practice on all populations of students, particularly those traditionally marginalized such as English-language learners and students with disabilities. (D4)</td>
<td>Schools will develop a strategic plan to make technology integral to curriculum, instruction, and assessment, accommodating different learning needs and helping teachers individualize and improve the learning process. (30)</td>
<td>Provide professional development for closing the gap in achievement between students of color, economically disadvantaged students and their peers. (A1)</td>
</tr>
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### Are STEM and PLTW Initiatives Working? Tools and Resources for Decision-Making

Implementing reforms and innovations in secondary schools that result in better student achievement and success beyond high school is a major challenge for leaders. More specifically, Achieve, Inc.—a national partnership of Governors and industry leaders—identifies three critical challenges confronting states, communities, and schools seeking to implement science, technology, engineering, and mathematics (STEM) curricula.

To prepare students for STEM careers in both postsecondary education and workplaces, high schools must focus directly on graduating students who are college-ready and work-ready by:

(a) using standards and assessments that align instruction, graduation requirements, and college admission and placement criteria.
(b) using P-16 longitudinal data systems to track the progress of states and schools in raising the post-high school readiness of all students.
(c) holding themselves accountable for graduating students who are college and work ready.

(ACHIEVE, 2006)

As the upcoming sections reveal, this Guidebook provides data collection and analysis tools, reflection questions, and action plans, which are designed to ensure that local PLTW teams and their partners can make effective decisions. The eleven Guiding Questions (see Appendix A) allow teams and individual stakeholders to make informed decisions regarding:

(a) instructional improvements that are needed in the curriculum, instruction, or assessment practices (e.g., To what extent is the program being implemented fully or effectively?),
(b) program accountability (e.g., What do students learn? Are all students learning at comparable levels?), and
(c) student and graduate transitions (e.g., Do students make successful transitions from middle school to high school? Are program graduates successful in engineering college majors and careers?).
Four assumptions and principles serve as a foundation for this Guidebook:

1. The standards, instruction, and assessments used in high schools must be: clearly articulated and communicated, well-aligned with preparation (or readiness) standards for admission to postsecondary institutions, and focused on preparing students for both college and career opportunities.

2. Profiles of the success of students during high school, as well as in college and career settings, provide valuable insights for educators making program improvements and for students planning school-to-college and school-to-work transitions. Whenever possible, student level data is used in the spreadsheets or databases presented herein.

3. Longitudinal, student-level data systems provide the capacity to disaggregate the data and understand patterns of performance and transition for the increasingly diverse student population in Wisconsin schools.

4. K-16 integrated data systems provide the knowledge capacity for improving the articulation of programs, creating effective dual credit initiatives, mapping students’ career pathways, and providing public accountability for program investments.

The Technology and Pre-Engineering Pathway and Program Quality Indicators Chart (Figure 3) provides an overview for the PLTW career pathway, while also illustrating how the key points at which program improvement and accountability questions found in the Progress and Performance Profile are addressed.
Middle School

Grades 6–8

9 week instructional units
- Design and Modeling
- The Magic of Electrons
- The Science of Technology
- Automation and Robotics
- Flight and Space

High School

9–10

Foundation Courses
- College level Mathematics: Algebra I and/or II, Geometry, Trig/Pre-calculus
- Principles of Engineering
- Introduction to Engineering Design
- Digital Electronics

11

Specialization Courses
- College level Science: Biology, Chemistry, Physics
- Computer Integrated Manufacturing
- Civil Engineering and Architecture
- Biotechnical Engineering
- Aerospace Engineering

12

Capstone Course
- Engineering Design and Development

Higher & Postsecondary Education

13–16

Colleges & Universities
- Majors: Engineering
- Engineering Related Fields
- Sciences

Technical & Community Colleges
- Majors: Engineering
- Technology

Internships Work-based learning

A

Mentored Engineering Research Project

B

Internships Work-based learning

C

Internships

D

School & Community Context Questions
- School Enrollment Changes
- School Staff Credentials
- Regional Career Opportunities in Science, Technology, Engineering and Mathematics

Program Implementation Questions
- Tech Ed Enrollment
- Career Interests
- GTT Enrollment
- PLTW Course Enrollment
- Tech College Agreements
- Business and Industry Partnership Activities

Student and School Outcome Questions
- Student Achievement
- Focus Group Themes - Faculty
- Focus Group Themes - Student
- Math, Science & College Prep Credits
- Student Engagement
- Academic Course Enrollments
- End-of-Course Assessments

Post-School Outcome Questions
- Freshman Success Report, University of Wisconsin
- Graduate Enrollment in Wisconsin Technical Colleges
- Technical College Program Enrollments

Pathway:

Engineering Workforce Participation
Continuing Engineering Education

Engineering & Engineering Technology Workplaces
Continuing Engineering Education
THE PROGRESS AND PERFORMANCE PROFILE

Each month schools and educators gain access to more data describing students, instructional practices, student achievement, and other factors that influence teaching and learning. Data is readily available describing changing school populations, students and their academic progress, as well as their transition to college and career settings. The Progress and Performance Profile (PPP) organizes data from multiple sources to ensure its effective use by teachers, counselors, administrators, local industry partners, and policy makers. Each of these major stakeholders need data summaries (tables and charts) and progress reports to guide and inform decisions about program improvement, school to college transition support services, and program accountability.

The Profile is organized to provide longitudinal (multiple year) data on four sets of indicators: (A) School and Community Context; (B) Program Implementation; (C) Student and School Outcomes; (D) Post-School Outcomes. These four indicators address eleven essential guiding questions about technology education programs in middle schools and high schools that are frequently posed by parents, educators, school board and community members, and policy makers are addressed.

For each of these indicators, several reflection questions were developed to assist local PLTW teams in identifying trends that are problematic and need to be addressed with program improvements or in local policy changes, such as new dual credit arrangements with local technical or community colleges. The reflection questions are also structured to identify positive trends in the data, such as increases in advanced math, science, and technology course taking by PLTW students or by young women or low-income students, that could be used in press releases or school performance reports. Appendix C contains the reflective questions that were developed.

Profile Indicator Descriptions

The following sections provide details on each of the four Profile assessment indicators and how they address the guiding questions. An example data table is presented and discussed for each of the eleven guiding questions. The related reflective questions for each set of indicators are addressed with data summary charts and recommendations for school improvement.¹

¹The various tables in this section represent fictitious data.
SCHOOL AND COMMUNITY CONTEXT

The School and Community Context Indicators provide data on: school enrollment trends for student subgroups, the number and qualifications of staff members available to implement the PLTW program each year, and the 10-year forecast of regional growth in STEM occupations. These data provide a useful perspective on the local or regional engineering and science careers and recent trends in program inputs and ingredients—student enrollment patterns and the PLTW educational team.

Guiding Questions

A.1 Who attends this school?

A.2 What are the credentials of educators at this school?

A.3 What are the regional science, technology, engineering and mathematics (STEM) career opportunities?

Context Indicators:

A1 – School Enrollment

<table>
<thead>
<tr>
<th>Baseline Year 2003-04</th>
<th>2004-05</th>
<th>Change</th>
<th>2005-06</th>
<th>Change</th>
<th>2006-07</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total School Enrollment</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>149</td>
<td>208</td>
<td>59</td>
<td>229</td>
<td>21</td>
<td>233</td>
</tr>
<tr>
<td>Black, not Hispanic</td>
<td>518</td>
<td>599</td>
<td>81</td>
<td>623</td>
<td>24</td>
<td>635</td>
</tr>
<tr>
<td>Hispanic</td>
<td>396</td>
<td>439</td>
<td>43</td>
<td>468</td>
<td>29</td>
<td>483</td>
</tr>
<tr>
<td>American Indian/Alaskan Native</td>
<td>34</td>
<td>31</td>
<td>-3</td>
<td>35</td>
<td>4</td>
<td>39</td>
</tr>
<tr>
<td>White, not Hispanic</td>
<td>955</td>
<td>849</td>
<td>-106</td>
<td>852</td>
<td>3</td>
<td>883</td>
</tr>
<tr>
<td>Female</td>
<td>142</td>
<td>152</td>
<td>10</td>
<td>149</td>
<td>-3</td>
<td>155</td>
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<tr>
<td>Low Income</td>
<td>1145</td>
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<td>1161</td>
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<tr>
<td>LEP</td>
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<tr>
<td>IEP</td>
<td>177</td>
<td>176</td>
<td>-1</td>
<td>183</td>
<td>7</td>
<td>187</td>
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<tr>
<td><strong>Total School Enrollment</strong></td>
<td>2052</td>
<td>2126</td>
<td>74</td>
<td>2207</td>
<td>81</td>
<td>2273</td>
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The school enrollment data table provides an overall description of the demographics of the school. The data are presented for each school year, beginning with year prior to the implementation of PLTW courses or GTT instructional units in the high school or middle school. The initial year of data provides a baseline for annual comparisons of changes in the school’s population using student characteristics that are often required in Federal and state reports and frequently used in the media.

Data are reported for the baseline year and annually thereafter throughout the Profile. The enrollment counts by ethnicity and gender are based on the school’s attendance as of the third Friday in September each year. In the 2004-05 academic year the Wisconsin Department of Public (DPI) began compiling this information from the Individual Student Enrollment System (ISES), which may create some difficulty in interpreting the data across years. Readers can view the DPI website for complete information on the data collection methods employed to compile the demographic data on school enrollees. (http://www.dpi.wi.gov/spr/demog_q&a.html).
It is important to note that one of the national PLTW goals is to increase the number of female and minority students involved in engineering education and pursuing STEM careers through postsecondary education. When combined with the PLTW and GTT Enrollment Indicators (Table B1), each school can use their demographic profile to gain insights on the local changes in providing female and minority students with access to engineering and technology career paths.

Data Source: State of Wisconsin, Department of Public Instruction, http://dpi.wi.gov/lbstat/pubdata2.html

A2 – School Staff Credentials

<table>
<thead>
<tr>
<th>Instructors and Counselors</th>
<th>Baseline Year</th>
<th>2004-05</th>
<th>2005-06</th>
<th>2006-07</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PLTW Trained</td>
<td>FTE</td>
<td>PLTW Trained</td>
<td>FTE</td>
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<tr>
<td>Math</td>
<td></td>
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<td>5.6</td>
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<td>5.8</td>
</tr>
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<td>High School</td>
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<td>10.7</td>
<td>12.3</td>
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<td>Science</td>
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<td>Middle School</td>
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<td>High School</td>
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<td>Technology Education</td>
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<td>Counselors</td>
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<td>1.6</td>
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</tr>
<tr>
<td>High School</td>
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<td>4.3</td>
<td>4.3</td>
<td>4.3</td>
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<tr>
<td>Number of M/S/T faculty w/graduate degrees</td>
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<td></td>
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<td>Middle School</td>
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<td>9.6</td>
<td>9.6</td>
<td>9.8</td>
</tr>
<tr>
<td>High School</td>
<td>14.3</td>
<td>12.7</td>
<td>13</td>
<td>13.2</td>
</tr>
</tbody>
</table>

¹Numbers reflect only M/S faculty data obtained from DPI

This table describes the number and status of the instructional and support staff at each middle school or high school. In some cases, it might describe the staffing allocations throughout the school district for the middle and high schools. Instructors and counselors involved directly in the GTT or PLTW program are identified as PLTW trained staff members. It is important to note that technology education, mathematics or science teachers must successfully complete a PLTW Summer Institute before courses or instructional modules are implemented. Additionally, at least one guidance counselor from each school must attend a Counselor’s Conference conducted by a PLTW Affiliated university or college. The total size of the instructional departments and guidance staff at the participating middle and/or high schools is shown. The number of staff is described in FTE (full time equivalent), which describes the total amount of instructional or guidance staff member time available in the school year. (Some instructors and guidance counselors hold part-time loads in other departments.) The total number of staff members who have completed the PLTW institutes or conferences is listed in the first column for each year. The second column indicates the number of full-time-equivalent instructors or guidance counselors.

The math and science teachers included in this data are highly-qualified educators, according to the criteria defined in the Elementary and Secondary Education Act (ESEA). The graduate degree numbers reflect the number of teachers who have earned a master’s degree or higher. It is important to note that teachers’ graduate degrees may or may not be related to their teaching area. To learn more about the staff data provided by the Wisconsin Department of Public Instruction, go to http://dpi.wi.gov/spr/teach_q&a.html.
Data Source: State of Wisconsin, Department of Public Instruction, http://dpi.wi.gov/sig/dm-stafftchr.html High school database

A3 – Career Opportunities in STEM

This table describes the long-term labor market projections for job openings in selected engineering, engineering technology and related occupational clusters. Employment is defined as a count of jobs in the occupational code, including all full- and part-time non-farm jobs as well as jobs filled by self-employed and unpaid family workers. In the annual openings column, replacements are the estimated number of positions created by employees permanently leaving a position for a different occupation, retirement, or leaving the labor force for other reasons, such as plant or firm closure. Openings that are created by someone changing employers but not occupations are not included. Replacements plus new jobs yields the total number of people that are needed annually through 2014 for particular occupations.


At the WorkNet website, users will first click on the Data Analyst icon. Next, select the Data Table item. From this page, you will select Occupation Projections, and indicate that you will be performing a Query.

To examine the projections for your region of the state, select the appropriate Workforce Development Areas (the state is divided into 11 areas or regions). You can choose to look at the short term (2005-2007) or long term (2004-2014) projections for any occupation or cluster of occupations.

When using this resource for planning PLTW programs or GTT modules, or when preparing information for students and parents about the regional labor market, it is recommended that you consider the following STEM related occupational clusters:

15-0000 Computer and Mathematical Occupations
17-0000 Architecture and Engineering Occupations
19-0000 Life, Physical, and Social Science Occupations
47-0000 Construction and Extraction Occupations

Reflection Questions: School and Community Context Indicators

1. In what ways is the school population changing?
2. What career and educational planning activities are offered annually to ensure that parents and students are familiar with trends in science and engineering career fields?
3. To what extent has the district maintained and developed a highly qualified faculty in technology, science and mathematics?
4. What career opportunities are available to students enrolling in technology and pre-engineering courses?

Examining the Evidence: Observations and Recommendations

In what ways is the school population changing?

![Changing School Enrollment Patterns](chart)

Observations:

As can be seen in this chart, the demographics of the school population has been changing over the last four years. While total enrollment has increased by 10.8% in that time period, the proportion of non-White students in the population has increased by 8.3% in the same four-year period.

Action Recommendations:

1. It is critical that the PLTW team, including administrators, teachers and counselors, consider the growing diversity of their student population when planning their program. In particular, counselors need to ensure that underrepresented students are aware of the program and benefits it provides.
2. When planning business community involvement, it is essential that minority engineers and technicians be invited to serve as members of the Community Partnership Team and that they be encouraged to mentor both PLTW instructors and students.
What are the credentials of educators at this school?

Observations:
Although the number of math teachers has increased, the numbers of science and technology education teachers has decreased slightly in this school. Also, the number of math and science teachers holding a master’s degree or higher has decreased by 7% in the same time period, which is likely due, in part, to teacher turnover. However, in a school with increasing enrollment during the same time period, this data is crucial to the improvements efforts of this school.

Action Recommendations:
1. Since the STEM staffing is stable or declining slightly, school leaders need to review the school enrollment trends and projections. Projected enrollment growth in the STEM courses and programs, even with level school wide enrollments, will require a major investment in STEM-focused professional development, including a commitment to send more teachers and counselors to PLTW Summer Institutes in addition to the two staff members that were trained prior to the PLTW implementation.
2. Teachers should be encouraged to pursue both master’s degrees and PLTW certification to effectively accommodate the rising percentage of challenging students.
Observations and Action Recommendations

What are the regional science, technology, engineering and mathematics (STEM) career opportunities?

Observations:
State or regional labor force projections can be considered when determining which STEM and PLTW courses to offer. According to Wisconsin’s Workforce and Labor Market Information System (http://worknet.wisconsin.gov/worknet), there is a statewide predicted need for workers in engineering and engineering-related fields through 2014. If the projections are accurate, there will be a 27% increase in Computer and Mathematical Occupations and nearly a 17% increase in Life Science Occupations. These projections are based on openings created by current workers leaving the workforce as well as by new openings occurring that are created in engineering firms and related organizations.

Action Recommendations:
1. These trends suggest that PLTW specialization courses in Computer Integrated Manufacturing and Bio-medical Engineering should be offered, along with Civil and Architectural Engineering.
2. Counselors and PLTW Instructors should jointly plan annual events, such as career fairs and half day tours to local firms hiring engineers and technicians in these specialties.
The Program Implementation Indicators summarize and track changes at the school level in program course enrollments, the STEM career interest patterns of 8th and 10th grade students, and the activities of the local business, industry and higher education partner organizations supporting PLTW. Each of these data tables describe the progress being made each year in: identifying and recruiting students with STEM career interests, implementing courses and building a comprehensive program, and working closely with local industry and college partners to assist students in understanding and embarking on a technology and engineering career path.

Guiding Questions

B.1 Who enrolls in Technology Education and PLTW classes and programs?
B.2 What are the career interests of students at this school?
B.3 Which community resources and postsecondary connections support the program?

Program Implementation Indicators

B1 – PLTW Course Enrollments (High School)

<table>
<thead>
<tr>
<th>PLTW Course Enrollments</th>
<th>Baseline Year 2003-04</th>
<th>2004-05 Change in Enrollment</th>
<th>2005-06 Change in Enrollment</th>
<th>True Outcomes Registrations</th>
<th>Grades Submitted to 10</th>
<th>2006-07 Change in Enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction to Engineering Design</td>
<td>24</td>
<td>24</td>
<td>-8</td>
<td>46</td>
<td>48</td>
<td>44</td>
</tr>
<tr>
<td>Principles of Engineering</td>
<td>24</td>
<td>24</td>
<td>-1</td>
<td>19</td>
<td>23</td>
<td>26</td>
</tr>
<tr>
<td>Digital Electronics</td>
<td>19</td>
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<td>19</td>
<td>19</td>
<td>18</td>
</tr>
<tr>
<td>Computer Integrated Manufacturing</td>
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<td>16</td>
<td>16</td>
<td>20</td>
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<td>Civil Engineering and Architecture</td>
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<td>19</td>
<td>18</td>
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<td>19</td>
<td>18</td>
</tr>
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<td>106</td>
<td>100</td>
<td>106</td>
<td>108</td>
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</tbody>
</table>

The PLTW Course Enrollments table describes the number of students participating in Project Lead the Way courses at each middle school or high school. The full workbook for the table includes data describing the gender and ethnicity of students enrolled in each class being offered. This table illustrates the emerging enrollment patterns as additional teachers are trained, and more courses are offered over an extended time period.

The True Outcomes columns (Registrations and Grades Submitted) identify the number of enrolled students who have also registered on the True Outcomes website, and the number of final course grades the teacher has submitted for each course. True Outcomes is a research and evaluation firm based in Arlington Virginia, which has been contracted by Project Lead the Way to conduct annual assessments of the PLTW program over the next five years. Students are encouraged to register on the True Outcomes website so that the success of the PLTW program can be tracked to address important questions about which students (especially female and ethnically diverse students) enroll in and complete courses, and subsequently pursue college majors in engineering and engineering technology. State and local reports are generated each year providing this important assessment and registration data to PLTW teams. Details about the True Outcomes PLTW registration system can be found at: (https://www.trueoutcomes.net/pltw).
Data on students’ grades on the end-of-course assessments are presented and discussed in the C6 – Student Outcomes indicator section of the PPP.

This table provides a snapshot of the PLTW enrollment trends in specific courses and in the overall program. The “change” columns enable the reader to quickly recognize the 2-year or 3-year enrollment trends, which are valuable in future program planning, scheduling teacher training, and documenting information important for program certification.

**B1 – GTT Course Enrollments (Middle School)**

<table>
<thead>
<tr>
<th>GTT Participation</th>
<th>Base Year 2003-04</th>
<th>2004-05</th>
<th>% of Students in Optional TechEd</th>
<th>Change in Enrollment</th>
<th>2005-06</th>
<th>% of Students in Optional TechEd</th>
<th>Change in Enrollment</th>
<th>2006-07</th>
<th>% of Students in Optional TechEd</th>
<th>Change in Enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required TechEd - 6th Grade</td>
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<td>74</td>
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<td>74</td>
<td>85</td>
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<td>Required TechEd - 7th Grade</td>
<td>286</td>
<td>288</td>
<td>2</td>
<td>289</td>
<td>1</td>
<td>305</td>
<td></td>
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<td>16</td>
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<tr>
<td>Optional TechEd - 7th Grade</td>
<td>114</td>
<td>114</td>
<td>39.6%</td>
<td>0</td>
<td>115</td>
<td>38.9%</td>
<td>1</td>
<td>119</td>
<td>39.0%</td>
<td>4</td>
</tr>
<tr>
<td>Optional TechEd - 8th Grade</td>
<td>141</td>
<td>142</td>
<td>47.3%</td>
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<td>143</td>
<td>46.6%</td>
<td>1</td>
<td>143</td>
<td>49.5%</td>
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<td><strong>Total</strong></td>
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<td><strong>618</strong></td>
<td><strong>4</strong></td>
<td><strong>621</strong></td>
<td><strong>3</strong></td>
<td><strong>652</strong></td>
<td><strong>3</strong></td>
<td><strong>652</strong></td>
<td>31</td>
<td></td>
</tr>
</tbody>
</table>

This is the first table in the middle school version of the PPP that differs from the high school version. While Gateway to Technology is not taught as a separate class in the middle schools, assorted GTT modules are incorporated into the required technology education courses for 6th and 7th grade students. Additionally, 7th and 8th grade students can elect a technology education course in their schedule. These optional enrollments may result in some double-counts in the total GTT enrollment.

**Data Source:** School enrollment database
B2 – Tech Ed Enrollments

<table>
<thead>
<tr>
<th></th>
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<th></th>
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<tr>
<td>Broad Based Technology Education</td>
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<td>Grades 7-8</td>
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<td>0</td>
<td>652</td>
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<tr>
<td>Grades 9-10</td>
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<td>Engineering/Applied Courses</td>
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<tr>
<td>Grades 11-12</td>
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<td>2</td>
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<td>652</td>
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<td>1039</td>
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</tr>
</tbody>
</table>

The Tech Ed Enrollment indicator provides the total number of students enrolled in any Tech Ed course offered in the district for the three most recent years. Descriptions for the categories are available on the DPI website at http://dpi.wi.gov/lbstat/schedule.html.

The data is presented in two-year cohorts for grades 7-8, 9-10 and 11-12. The data source is disaggregated by gender, but in this example the gender-specific cells are not shown. The table also includes calculations that reflect the annual changes in Tech Ed enrollments.

In most Wisconsin school districts, the Broad-based Technology Education course is generally a requirement in the 7th and/or 8th grades, thus the enrollments are high in these exploratory courses at the middle school level.

These data can be used to gain an overview of the technology education trends in the district. As schools increase or decrease their emphasis in certain technology education curricular areas, those changes will be reflected in the enrollment patterns.
Data Source: Wisconsin Department of Public Instruction. Curriculum Enrollment Report. Annually, each district provides the course enrollment report to the Department of Public Instruction, so these data can be accessed by communicating with the local district data manager.

B3 – Career Interest Profiles

<table>
<thead>
<tr>
<th>WI Career Assessment Profile</th>
<th>Baseline Year 2003-04</th>
<th>2004-05</th>
<th>Change</th>
<th>2005-06</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent of 8th Graders w/ Investigative and Realistic in their interest profile</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>21.4%</td>
<td>30.4%</td>
<td>9.1%</td>
<td>31.3%</td>
<td>0.8%</td>
</tr>
<tr>
<td>Female</td>
<td>4.5%</td>
<td>4.4%</td>
<td>-0.1%</td>
<td>4.7%</td>
<td>0.3%</td>
</tr>
<tr>
<td>Percent of 10th Graders w/ Investigative and Realistic in their interest profile</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>25.6%</td>
<td>25.7%</td>
<td>0.1%</td>
<td>26.0%</td>
<td>0.3%</td>
</tr>
<tr>
<td>Female</td>
<td>4.6%</td>
<td>4.1%</td>
<td>-0.5%</td>
<td>4.0%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

The Wisconsin Career Assessment (WCA) is an online career interest inventory available to 8th and 10th grade students each year. Through a partnership between the Wisconsin Department of Public Instruction and Wisconsin Careers, the WCA is available at no cost to all schools administering the Wisconsin Knowledge and Concepts Exam (WKCE). The 180-question assessment is based on the O*NET Interest Profiler (http://online.onetcenter.org). By encouraging students to complete the WCA, schools can:

- provide students with immediate assessment results
- help students identify occupations that may be of interest to them
- help students explore possible academic and educational options
- help parents/guardians become aware of their child’s occupational and educational interests
- support critical workforce and economic development goals in Wisconsin
- use information about the occupational and educational aspirations of their students to assist them in planning courses, extracurricular, and summer or after-school experiences (http://www.cew.wisc.edu/wisc_career_assessment).

The assessment report provides the student with a three letter code which ranks their key interests. The interest areas are R-realistic, I-investigative, E-enterprising, S-social, A-artistic and C-conventional (http://online.onetcenter.org/find). Profiles containing both the realistic and investigative interest areas result in the greatest number of engineering and/or engineering technology related employment recommendations.

The Career Interests Profile table describes the percent of students who completed the assessment and obtained a three-letter code that included both Realistic and Investigative interest areas. Assuming that all 8th or 10th grade students complete the WCA, this data table provides an indication of the total number of students who could capitalize effectively on enrollment in pre-engineering or technology education classes or modules. Additionally, the WCA data can be used by the school counselors to assist students in selecting elective courses keeping in mind, of course, the relationship between engineering and the realistic/investigative profiles.

Data Source: WisCareers database http://wiscareers.wisc.edu/default.asp

This data is also available to the counselors in each school administering the Wisconsin Career Assessment.
More than 90 percent of high school students now plan to enter college following graduation from high school. One of the major goals of PLTW is to support postsecondary education enrollment in engineering and engineering technology programs at universities as well as 4-year and 2-year colleges. More than seventy-one percent of high schools (Waits, Setzer, & Lewis, 2005) now offer dual credit programs that allow students to earn high school and college credit while still enrolled in high school. Thus, an important measure of the rigor of a high school curriculum is the number of dual credit options provided to students.

The Wisconsin Technical College System Agreements indicator documents the number of advanced standing and transcripted credit agreements existing between the high school and any campus in the Wisconsin Technical College System (WTCS). Each year the WTCS updates annually the agreements in place for each technical college program. In 2007, the WTCS implemented a state-wide articulation agreement for the PLTW Digital Electronics course. Additional PLTW courses are under consideration for state-wide articulation agreements at this time.

Four program areas directly related to the Project Lead the Way courses were identified and tabulated specifically so that students, parents, and counselors are aware of the opportunities for obtaining dual credit for pre-engineering and technology courses. These programs are: Applied Engineering Technology, Electro-Mechanical Technology, Electronics, and Mechanical Design Technology.

WTCS agreements that specify any of the four Manufacturing and Industrial Technology Education programs (623, 620, 605, and 606 respectively) are designated as PLTW-linked course agreements. Agreements counted in the “Other Programs” area include a wide variety of course and program offerings, including agreements that cover courses applicable to multiple programs such as Technical Mathematics and Psychology. While these courses may not be directly applicable to pre-engineering or engineering technology programs, they may be applicable to general education requirements for associate degrees and/or certificates.

Data Source: You can locate and review the advanced standing and transcripted credit agreements between a high school and one or more Wisconsin Technical College campuses at the Wisconsin Technical College System reports website:

http://systemattic.wtcsystem.edu/reports/STW/articulation_agreements.htm
B5 – Business and Industry Partnership Activities

One of the commitments schools make in becoming part of the PLTW Network is forming a local Partnership Team (PT). This team, which meets frequently and maintains several active programs, is composed of representatives from local businesses, colleges, and the community. The representatives serve as mentors and coaches to the students and assist the PLTW teachers in solving operational problems with the curriculum. In the Engineering Design and Development capstone course, each team of students undertakes an engineering research project, which is mentored by a practicing engineer.

The Business and Industry Partnerships table describes the level of participation by local partners and other engineering professionals and technicians in delivering or helping to deliver instruction in various courses throughout the year. Compiled annually by the PLTW instruction team, this table describes three major sets of activities: (a) the number of PLTW students who participate in industry based learning experiences, (b) the number of educators offered industry based professional development opportunities, and (c) the number of business and industry partners participating in in-school learning experiences, such as career fairs, mentoring students, or serving as advisors on engineering research projects.

This information is particularly useful in documenting the activities of the local Partnership Team for purposes of Project Lead the Way school certification.

Data Source: PLTW Leaders and Teachers
Reflection Questions: Program Implementation

1. To what extent are enrollments increasing in PLTW courses? Is the participation of female, minority, and low income students growing or declining?
2. How well do PLTW students perform on the end-of-course assessments? To what extent are students completing the college credit end-of-course assessments?
3. To what extent are PLTW students registering with the PLTW national organization to receive college credit? Are students and parents fully aware of the college credit opportunities?
4. What are the recent, significant trends and patterns in math and science course enrollments? Are PLTW students pursuing college preparation level math and science courses?
5. Are PLTW courses attracting and serving female and minority students whose 8th and 10th grade career interest profiles are aligned with engineering and technology careers?
6. In what ways can we strengthen the role(s) of the local industry partnership team in program implementation?
7. To what extent are teachers using common project-based or project-focused learning experiences to align instruction in math, science and technology education classes?
Examining the Evidence: Observations and Recommendations

To what extent are enrollments increasing in PLTW courses? Is the participation of female, minority, and low income students growing or declining?

Observations:
1. Overall, Project Lead the Way enrollments have been increasing since the program was first implemented in the 2004-05 academic year at this school. The current enrollment of 108 students is an increase of 125% from Year 1 to Year 3. As a proportion of the total student body, the PLTW enrollment has doubled in two years from 2.3% in 2004 to 4.8% in 2006.
2. While overall enrollment is increasing, the participation of female students is declining in advanced courses.

Action Recommendations:
1. The steady increase in PLTW enrollment reflects a combination of several factors, including the quality and appeal of the curriculum, expanded middle school technology education opportunities, effective and engaging teaching, and an expanding interest among students and parents in STEM career fields. This data should be communicated to key community stakeholders, such as the School Board, parents, and members of the local partnership.
2. To address the declining interest of female students in advanced PLTW courses, the PLTW team will:
   (a) review the most recent research on gender factors affecting STEM students and meet with education researchers from a local university to discuss their recommendations for addressing the problem, (b) conduct focus groups with 9th and 10th grade females enrolled in POE and IED courses to identify factors affecting their future course selection decisions, and (c) invite local female engineers, technicians, and scientists to mentor student projects in the IED and POE course.
Are PLTW courses attracting and serving female and minority students whose 8th and 10th grade career interest profiles are aligned with engineering and technology careers?

**Observations:**
1. Across three years of GTT and PLTW implementation:
   a. the percent of 8th graders with engineering and technology career interests has grown from 21% to 31%, while the percent of 10th graders with comparable interests has remained stable at 25%.
   b. In each grade, the percent of female students with engineering and technology career interests has remained at a disproportionately low 4.0% to 4.7%

**Action Recommendations:**
1. With the assistance of the community partnership, identify and recruit more female engineers and technicians to be involved in student projects, in-school lectures and career fairs, and in mentoring students.
2. Plan and conduct focus groups with small groups of female middle school students and their parents to identify and discuss the barriers to participating in GTT and PLTW courses. Generate an action plan based on the focus group findings and recommendations.
STUDENT AND SCHOOL OUTCOMES

The Student and School Outcomes Indicators document how well students and the schools are performing on a number of measures related to science, technology, engineering, and mathematics education. The evidence is compiled from a number of sources, including the state assessments (in Wisconsin, the 8th or 10th grade WKCE exams). The academic performance of the school, as measured by the graduation rate, is also included because it is often used by policymakers to describe overall school performance. The extent of course taking in mathematics, science, and other academic areas is documented for PLTW and non-PLTW student cohorts.

This section also includes data from a national survey of student engagement, which should be administered to PLTW students and a sample of other students each year. While state and district leaders focus on how students perform on assessments, it is important to monitor how actively students are engaged in the learning processes and experiences which generate the tested knowledge and proficiency. In an initial investigation, the High School Survey of Student Engagement (HSSSE) was used to compile data on student behavior and attitudes and the school environment. The HSSSE allows school leaders to determine whether or not PLTW students are responding differently to high school learning opportunities than their peers. By using this survey, school leadership teams can compare the responses of PLTW and non-PLTW students, as well as the national cohort of students completing the HSSSE. A copy of the 2006 HSSSE instrument is presented in Appendix D.

In addition to academic performance and school engagement data, the first hand impressions of PLTW students and the instructional team provide useful information on the program’s progress and outcomes. In the Progress and Performance Profile pilot study, an external evaluation team visited each of the schools in the late spring to conduct focus groups with a sample of PLTW students and the PLTW instructional team (including building administrators and counselors). Both focus groups were posed questions to identify the strengths, benefits, and challenges in the PLTW curriculum and learning experiences. The audio recordings of each focus group were analyzed by the evaluators to identify how students and staff were judging the quality, comprehensiveness, benefits, and implementation challenges associated with the PLTW programs at each school. Key summary phrases and illustrative comments from staff and students are included in this section of the Profile. Appendix B includes the Focus Group Questions that were used to guide the discussions with both middle school and high school students and with faculty and staff from each setting.

Guiding Questions

C.1 To what extent are students motivated and engaged by PLTW and technology education instruction?

C.2 To what extent are PLTW and technology education students learning important engineering knowledge, as represented by the end of course assessments?

C.3 To what extent are enrollment increases in technology education and PLTW courses associated with increased academic learning and achievement?
Student and School Outcomes Indicators

C1 – Student Achievement and High School Graduation Rate

The Wisconsin Knowledge and Concepts Examination (WKCE) is a statewide standardized assessment given each year to students in grades 4, 8, and 10. The exam measures student achievement in five subject areas: reading, language arts, mathematics, science, and social studies. Students also provide a rough draft writing sample. There are five levels of proficiency students can achieve on the WKCE assessment: advanced, proficient, basic, minimal performance and pre-requisite skill. Each of the first four proficiency levels in each subject and at each grade level is associated with a range of scores on the WKCE. The fifth level, pre-requisite skill, describes an achievement level below the range tested on WKCE. Detailed descriptions of the proficiency levels by subject and grade are available on-line (http://data.dpi.state.wi.us/data/selschool.asp). In accordance with the No Child Left Behind Act, the long-term goal is for all students, except selected students with severe disabilities, to progress to the proficient or advanced levels by the school year 2013-14. (http://dpi.wi.gov/oea/kce_q_a.html).

The Student Achievement indicator describes the percent of students who achieved the advanced or proficient level on the WKCE assessment in the 8th and 10th grades. The change column allows the user to quickly recognize the school’s yearly trend in achievement performance on math and science assessments—both of which can, according to recent research, be indirectly influenced by courses that offer learning opportunities to apply math and science concepts.

As noted below, the WKCE data is available on the Wisconsin’s Information Network for Successful Schools (WINSS) page of the Department of Public Instruction website at http://dpi.state.wi.us/sig/index.html. On this website, the data profile can be prepared for individual schools or for districts to assess the math and science performance of 8th and 10th graders.

High school graduation rates as reported to the Wisconsin DPI are included in this table. The high school graduation rate is an important accountability measure for high schools under the No Child Left Behind Act. This data element documents the percent of students who have earned a regular high school diploma in the past year. Any high school diploma granted by a school board that meets the requirements of Wisconsin Statute §118.33 (1) (a) or (d), is considered a regular high school diploma.
A question frequently asked by high school parents is: Will enrollment in elective, non-academic courses limit my child’s access to college? Historically, students who concentrate their studies in career and technical education take fewer advanced academic courses. To gain more insight on this question, one PLTW team designed this student outcome indicator to examine the total number of credits taken by a recent graduating class. As reflected in the table, the transcripts of students who completed three or more credits in PLTW-like technology education courses (e.g., engineering design, manufacturing, etc.) were compared with graduates who had taken fewer or no credits in technology education.

The Math, Science and College-Prep Credits indicator table describes the average number of high school credits earned by Tech Ed (n=59) and non-Tech Ed students (n=143) in the class of 2003 (n=202). The data in the right hand column document the average number of credits for the class of 2003.

Generated from information in the high school’s data management system, this data table can be used to illustrate to students, parents, and guidance counselors the importance of balancing the pre-engineering courses with enrollment in academic and college preparatory courses. Graduates focusing on technology education courses from this high school were particularly disadvantaged by completing significantly fewer foreign language and AP courses than their peers.

Data Source: School district management or student information systems (e.g., Skyward, SASI, etc.)
C3 – Academic Course Enrollments

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumer Math</td>
<td>57</td>
<td>68</td>
<td>11</td>
<td>19%</td>
<td>74</td>
<td>6</td>
<td>-14</td>
<td>-19%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Algebra I</td>
<td>241</td>
<td>285</td>
<td>44</td>
<td>18%</td>
<td>295</td>
<td>10</td>
<td>4%</td>
<td>299</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Algebra II</td>
<td>337</td>
<td>306</td>
<td>-31</td>
<td>-9%</td>
<td>330</td>
<td>24</td>
<td>8%</td>
<td>322</td>
<td>-8</td>
<td></td>
</tr>
<tr>
<td>Geometry</td>
<td>391</td>
<td>343</td>
<td>-48</td>
<td>-12%</td>
<td>331</td>
<td>-12</td>
<td>-3%</td>
<td>338</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Functions, Statistics &amp; Trigonometry</td>
<td>145</td>
<td>160</td>
<td>15</td>
<td>10%</td>
<td>183</td>
<td>23</td>
<td>14%</td>
<td>195</td>
<td>12</td>
<td>7%</td>
</tr>
<tr>
<td>Precalculus/Calculus/AP Math</td>
<td>182</td>
<td>204</td>
<td>22</td>
<td>12%</td>
<td>229</td>
<td>25</td>
<td>12%</td>
<td>257</td>
<td>28</td>
<td>12%</td>
</tr>
<tr>
<td><strong>Total Mathematics</strong></td>
<td><strong>1353</strong></td>
<td><strong>1366</strong></td>
<td><strong>13</strong></td>
<td><strong>1.0%</strong></td>
<td><strong>1442</strong></td>
<td><strong>76</strong></td>
<td><strong>5.6%</strong></td>
<td><strong>1471</strong></td>
<td><strong>29</strong></td>
<td><strong>2.0%</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical and Earth Science</td>
<td>374</td>
<td>300</td>
<td>-74</td>
<td>-20%</td>
<td>381</td>
<td>81</td>
<td>27%</td>
<td>413</td>
<td>32</td>
<td>8%</td>
</tr>
<tr>
<td>Biology and Human Biology</td>
<td>388</td>
<td>395</td>
<td>7</td>
<td>1%</td>
<td>388</td>
<td>-7</td>
<td>4%</td>
<td>438</td>
<td>50</td>
<td>13%</td>
</tr>
<tr>
<td>Biology Honors and Advanced</td>
<td>249</td>
<td>211</td>
<td>-38</td>
<td>-15%</td>
<td>231</td>
<td>20</td>
<td>9%</td>
<td>280</td>
<td>49</td>
<td>21%</td>
</tr>
<tr>
<td>Chemistry</td>
<td>215</td>
<td>212</td>
<td>-3</td>
<td>-1%</td>
<td>194</td>
<td>-18</td>
<td>-8%</td>
<td>221</td>
<td>27</td>
<td>14%</td>
</tr>
<tr>
<td>Chemistry AP and Honors</td>
<td>108</td>
<td>125</td>
<td>17</td>
<td>16%</td>
<td>106</td>
<td>-19</td>
<td>-15%</td>
<td>111</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Astronomy Honors and Physics</td>
<td>73</td>
<td>88</td>
<td>15</td>
<td>21%</td>
<td>87</td>
<td>-1</td>
<td></td>
<td>103</td>
<td>16</td>
<td>18%</td>
</tr>
<tr>
<td>Physics Honors and AP</td>
<td>43</td>
<td>43</td>
<td>0</td>
<td>0%</td>
<td>51</td>
<td>8</td>
<td>16%</td>
<td>71</td>
<td>20</td>
<td>39%</td>
</tr>
<tr>
<td>IB Biology</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0%</td>
<td>20</td>
<td>20</td>
<td>100%</td>
<td>22</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td><strong>Total Science</strong></td>
<td><strong>1450</strong></td>
<td><strong>1374</strong></td>
<td><strong>-76</strong></td>
<td><strong>-5.2%</strong></td>
<td><strong>1458</strong></td>
<td><strong>84</strong></td>
<td><strong>6.1%</strong></td>
<td><strong>1659</strong></td>
<td><strong>201</strong></td>
<td><strong>13.8%</strong></td>
</tr>
</tbody>
</table>

One of the goals of the PLTW curriculum is to complement academic offerings in mathematics and science. All PLTW students are encouraged to complete four years of mathematics and science in high school.

By engaging more middle school and early high school students in technology and pre-engineering courses, constructivist teaching approaches suggest that students will acquire an interest in learning more science or mathematics to deepen their understanding of specialties in engineering such as aerospace, architectural, or biomedical engineering. To determine the extent to which this approach to learning is effective in particular schools, this data table describes the total number of students enrolled in the various mathematics and science courses offered at a particular school annually. Similar to several previous tables, the data in this table can be disaggregated so that trends can be assessed by gender and ethnicity for each class offered.

The change columns in this table provide a tool for analyzing patterns and trends in math and science enrollments. When PLTW is launched as part of a school improvement process, this table can demonstrate the extent to which the academic rigor of the overall curriculum is enhanced by students’ decisions to enroll in honors or advanced placement math and science coursework. Honors and Advanced Placement enrollments are not separated from standard curriculum courses in the table above but additional rows could be added to the table to disaggregate those enrollments for more precise trend information.

Data Source: School enrollment database
### C4 – Focus Group Themes

<table>
<thead>
<tr>
<th>Emergent Themes—PLTW Faculty Focus Group</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>** Strengths of the program? **</td>
<td>Project based; Rigor and relevance; &quot;geared toward more real world than what I was doing the past&quot;; Get's you working with community partners; Kids see a real life problem; Helps kids make informed choices because they understand the career</td>
</tr>
<tr>
<td>** Transfer of learning/Cross-curricular opportunities? **</td>
<td>Impact on engagement; Learning to learn, Application; Relativity; Rigor</td>
</tr>
<tr>
<td>** Implementation strengths? **</td>
<td>&quot;Energized me again which helped my teaching style&quot;; This stuff is so cool (software); Used virtual academy and e-mailed master teachers and network of teachers; We will see a move towards a national curriculum</td>
</tr>
<tr>
<td>** Implementation needs? **</td>
<td>PLTW (national) could negotiate equipment purchasing; &quot;Funny credits&quot; are offered or they are from an obscure program.; In order to articulate with the technical colleges there must be 80% of the tech college curriculum...doesn't happen with PLTW; Still up to student to negotiate credits; Need to market the program better internally; Finance (sustainability) is a concern; Need to market to parents; Need agreements with higher ed; PLTW needs to do the foot work with college admissions and professional organizations</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Emergent Themes—PLTW Student Focus Group</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>** Why did you enroll? **</td>
<td>&quot;I took a lot of math and science and I was looking for a class that I could apply that&quot;; career exploration; “Had some interest but wanted to get some background”; Transfer credit option</td>
</tr>
<tr>
<td>** What did you find most interesting or like the most about the classes? **</td>
<td>Hands on aspect of the program; You think so differently because you cannot just look up the answers you have to come up with the solution it is more critical type of thinking</td>
</tr>
<tr>
<td>** Strengths of the program? **</td>
<td>&quot;This is as challenging as an AP math or science&quot;; “You don’t need to go into engineering to appreciate what you learn in this class”</td>
</tr>
<tr>
<td>** Transfer of learning/Cross-curricular opportunities? **</td>
<td>It’s a better learning experience because you are self motivated; The learning that comes from when it doesn’t work is just as valuable as the learning when it does work; “After PLTW you can see in your head when studying it in Physics class and you know the Why.”; Topics like Electricity, torque, electronics</td>
</tr>
<tr>
<td>** Changes you would make? **</td>
<td>Some students are scared off because it is “engineering”; Tech ed seems like a different society and students bridge the gap between tech teachers and academics; looking back on this now, I wish we had this earlier in high school or in middle school</td>
</tr>
</tbody>
</table>

As noted earlier, focus group interviews were conducted with both the PLTW instructional team and students at separate times. The questions used in each focus group are presented in Appendix B. Students in the interview groups were selected by the PLTW instructional team and represented a variety of grades, ages and courses. Each focus group was recorded (with the informed consent of each participant, including the consent of parents for students who are minors). Graduate students from a nearby university independently reviewed the tapes and compiled separate summary reports identifying the major themes and key informative comments from each group. The independent reports were compared and common themes were compiled in a final report to the school leadership teams and the principal. This qualitative data can be used to enhance the statistical data presented in other tables.
C5 – Student Engagement

<table>
<thead>
<tr>
<th>Student Engagement</th>
<th>2005-06</th>
<th>HSSSE 2006 National Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Question 16: How much has your experience at this school contributed to your growth in the following areas:</td>
<td>PLTW n=62</td>
<td>Non-PLTW n=19</td>
</tr>
<tr>
<td>(a) Acquiring skills related to work after high school</td>
<td>75.8%</td>
<td>57.9%</td>
</tr>
<tr>
<td>(b) Writing effectively</td>
<td>58.1%</td>
<td>52.6%</td>
</tr>
<tr>
<td>(c) Speaking effectively</td>
<td>62.9%</td>
<td>63.2%</td>
</tr>
<tr>
<td>(d) Thinking critically</td>
<td>71.0%</td>
<td>52.6%</td>
</tr>
<tr>
<td>(e) Reading and understanding challenging material</td>
<td>61.3%</td>
<td>47.4%</td>
</tr>
<tr>
<td>(f) Using computers and the Internet</td>
<td>77.4%</td>
<td>73.7%</td>
</tr>
<tr>
<td>(g) Working well with others</td>
<td>69.4%</td>
<td>68.4%</td>
</tr>
<tr>
<td>(h) Learning independently</td>
<td>59.7%</td>
<td>57.9%</td>
</tr>
<tr>
<td>(i) Solving real-world problems</td>
<td>53.2%</td>
<td>47.4%</td>
</tr>
<tr>
<td>(j) Gaining awareness of conditions in the community outside of school</td>
<td>48.4%</td>
<td>26.3%</td>
</tr>
<tr>
<td>(k) Developing clear career goals</td>
<td>64.5%</td>
<td>36.8%</td>
</tr>
<tr>
<td>(l) Understanding the relevance of school work to life after high school</td>
<td>58.1%</td>
<td>42.1%</td>
</tr>
<tr>
<td>(m) Understanding people of other racial and ethnic backgrounds</td>
<td>43.5%</td>
<td>36.8%</td>
</tr>
<tr>
<td>(n) Understanding yourself</td>
<td>46.8%</td>
<td>52.6%</td>
</tr>
<tr>
<td>(o) Treating people with respect</td>
<td>64.5%</td>
<td>52.6%</td>
</tr>
<tr>
<td>(p) Developing personal beliefs and values</td>
<td>45.2%</td>
<td>36.8%</td>
</tr>
</tbody>
</table>

While student achievement in reading, mathematics, science and pre-engineering or technology education are important measures of successful high schools, it is also important to measure the quality of student engagement and learning experiences associated with high achievement. Developed at Indiana University, the High School Survey of Student Engagement (HSSSE) is used to document, describe, and monitor student engagement in educationally purposeful activities in secondary schools nationally (http://ceep.indiana.edu/hssse/html/about.htm). The survey is a paper and pencil instrument which takes approximately 30 minutes for each student to complete. The survey data are compiled by HSSSE team and reports generated for each school, which includes the national data for the engagement factors assessed each year.

Data in the Student Engagement indicator table describe the results of the HSSSE for both PLTW and non-PLTW students at the high school. In the school illustrated in C5, all of the enrolled PLTW students completed the survey. Additionally, the PLTW instructors selected a demographically similar but smaller group of students who were not enrolled in PLTW to serve as a comparison group for this analysis.

The first two columns describe the percent of PLTW and Non-PLTW students responding “Quite a Bit” and “Very Much” on all sub-parts of Question 16 of the HSSSE (see below). The third column presents the difference between PLTW and non-PLTW students on this question, while the 4th column presents the comparable data from the 2006 national sample of students completing the HSSSE.
HSSSE Question #16: How much has your experience at this school contributed to your growth in the following areas?

a. Acquiring skills related to work after high school
b. Writing effectively
c. Speaking effectively
d. Thinking critically
e. Reading and understanding challenging material
f. Using computers and the Internet
g. Working well with others
h. Learning independently
i. Solving real-world problems
j. Gaining awareness of conditions in the community outside of school
k. Developing career goals
l. Understanding the relevance of school work to life after high school
m. Understanding people of other racial and ethnic backgrounds
n. Understanding yourself
o. Treating people with respect
p. Developing personal beliefs and values

Data Source: The High School Survey of Student Engagement. Instruments, scoring, and reporting provided by the Indiana University, see: http://ceep.indiana.edu/hssse
One of the key and unique features of the PLTW curriculum is the end-of-course assessments. Prepared by college professors and engineers each year, these assessments provide students with valuable insights on what and how much they have learned in each PLTW course, excluding the capstone course.

The end-of-course assessment for PLTW courses consists of three parts, and each student completes two of the three parts. Each part of the assessment is worth 50 points. All PLTW students complete Part A of the assessment, which addresses basic concepts for the course and is presented in a pen and paper, multiple-choice format. Students will take Part B or C, depending on their future college plans. Parts B and C focus on hands-on content applications and require students to develop essays. Students wishing to receive college credit for their high school PLTW coursework must complete Parts A and C, and achieve a score set by the affiliated university they plan to attend. Students who complete Parts A and B will receive high school credit (http://www.pltw.org/ecefaq.shtml).

The End-of-Course Assessments indicator table describes the average number of points earned on each part of the assessment administered for a particular class. Schools wishing to administer Part C of the assessment must be certified by Project Lead the Way.

The assessments are scored by the PLTW instructor and submitted electronically to the True Outcomes website. As noted earlier, True Outcomes has been contracted by Project Lead the Way to conduct annual assessments of the PLTW program and part of the data used in the national evaluation includes the end-of-course assessment scores from each school (https://www.trueoutcomes.net/pltw).

Data Source: PLTW Teachers, For individual school reports, see https://www.trueoutcomes.net/pltw

<table>
<thead>
<tr>
<th>End-of-Course Assessment Scores</th>
<th>2005-06</th>
<th>Composite Score Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part A</td>
<td>Part B</td>
<td>Part C</td>
</tr>
<tr>
<td>Introduction to Engineering Design</td>
<td>41</td>
<td>45</td>
</tr>
<tr>
<td>Principles of Engineering</td>
<td>42</td>
<td>46</td>
</tr>
<tr>
<td>Digital Electronics</td>
<td>40</td>
<td>45</td>
</tr>
<tr>
<td>Computer Integrated Manufacturing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Civil Engineering and Architecture</td>
<td>43</td>
<td>48</td>
</tr>
</tbody>
</table>

3/6/07 UW-Madison, Center on Education and Work
Reflection Questions: Student and School Outcomes

1. To what extent is greater participation in PLTW courses associated with an:
   a. increase in the graduation rate?
   b. increase in the 10th grade WKCE scores?
   c. improvement in student engagement measures (e.g., increased motivation, reporting more impact of school on personal and academic growth, etc.)?
   d. increase in math and science course completion in high school?

2. Do female and minority students enrolled in PLTW courses fare as well as other students in this program?

3. To what extent are PLTW students enrolling in appropriate additional math, science, and technology education courses?
Examine the Evidence: Observations and Recommendations

To what extent are students motivated and engaged by PLTW and technology education instruction?

Observations:
1. While the orientations and prior experiences of PLTW and non-PLTW students at this school are quite different, it is important to note that PLTW students were 16-27% more likely than non-PLTW students to say their recent school experiences affected their growth in:
   a. Acquiring skills related to work after high school (17.9% higher)
   b. Thinking critically (18.3% higher)
   c. Understanding the relevance of school work to life after high school (16.0% higher)
   d. Gaining awareness of conditions in the community outside of school (22.1% higher)
   e. Developing clear career goals (27.7% higher)
2. When compared to the national sample of students, those from XXX High School are much more likely to report higher growth in two areas: speaking effectively and using computers and the internet.

Action Recommendations:
1. Include the positive data on student engagement levels on the high school and district websites and in newsletters.
2. Develop strategies for tracking the high school engagement ratings of individual students and their subsequent success in college and STEM careers, which will provide more evidence on the specific aspects of PLTW instruction that are essential to the post school success of different students (e.g., solving real world problems, transferring knowledge to different courses).
To what extent are enrollment increases in technology education and PLTW courses associated with increased academic learning in advanced courses?

**Observations:**
1. This high school has experienced a steady 10% enrollment growth over the past four years.
2. During this same period, the number of students enrolled in Honors and AP math and science courses has been relatively stable. Following the introduction of PLTW courses in 004-05, the number of students enrolling in advanced courses has not declined.
3. Clearly, 33% more students are completing AP and Honor courses in science than in mathematics, which may be associated with the exposure to applied physics that students receive in the Introduction to Engineering Design and Principles of Engineering courses.

**Action Recommendations:** None recommended.
POST-SCHOOL OUTCOMES

The Post-School Outcomes Indicators section reports important data on the local education pipeline by describing the extent to which graduates are successfully entering college and pursuing science, technology and engineering studies. Included in this section are school level data for recent cohorts of graduates. For example, the number and percentage of graduates entering the Wisconsin Technical Colleges and the University of Wisconsin (UW) System’s 2- and 4-year campus are reported. The UW System’s Freshman Success Report, which is produced periodically for all high schools in Wisconsin, documents the campuses attended by each high school cohort, as well as each cohort’s ACT scores, remediation status, and retention for a second year at the campus attended initially. School level data reported annually by the WTCS reveals the percentage of graduates enrolling in a technical college campus within three years of graduating from high school, and the number of graduates enrolling annually in engineering and engineering technology degrees or certificate programs.

Guiding Questions

D.1 Are graduates entering and succeeding in the UW System of 2 and 4 year colleges?

D.2 Are graduates entering and succeeding in the Wisconsin Technical College System (WTCS) of 2-year colleges?

Post-School Outcome Indicators

D1 – UW System Freshman Success Report

<table>
<thead>
<tr>
<th>UW System Freshman Success Report</th>
<th>2001-2003 Graduates</th>
<th>2003 Graduates</th>
<th>% of 2003 Graduates</th>
<th>Statewide '03 Graduates</th>
<th>Statewide '03 Average %</th>
</tr>
</thead>
<tbody>
<tr>
<td>High School Graduates</td>
<td></td>
<td>347</td>
<td></td>
<td>63270</td>
<td></td>
</tr>
<tr>
<td>Percent completing ACT exam</td>
<td></td>
<td>251</td>
<td>65.9%</td>
<td>38785</td>
<td>57.3%</td>
</tr>
<tr>
<td>Entering any UW campus</td>
<td></td>
<td>381</td>
<td>37.2%</td>
<td>19571</td>
<td>30.9%</td>
</tr>
<tr>
<td>Entering any 4-year UW campus</td>
<td></td>
<td>306</td>
<td>32.6%</td>
<td>16910</td>
<td>26.7%</td>
</tr>
<tr>
<td>Madison</td>
<td></td>
<td>89</td>
<td>30</td>
<td>8.7%</td>
<td></td>
</tr>
<tr>
<td>Milwaukee</td>
<td></td>
<td>54</td>
<td>15</td>
<td>4.3%</td>
<td></td>
</tr>
<tr>
<td>Oshkosh</td>
<td></td>
<td>42</td>
<td>24</td>
<td>6.9%</td>
<td></td>
</tr>
<tr>
<td>Entering any 2-year UW campus</td>
<td></td>
<td>75</td>
<td>16</td>
<td>4.6%</td>
<td>2661</td>
</tr>
<tr>
<td>Waukesha</td>
<td></td>
<td>74</td>
<td>15</td>
<td>4.3%</td>
<td></td>
</tr>
<tr>
<td>Richland</td>
<td></td>
<td>1</td>
<td>1</td>
<td>0.3%</td>
<td></td>
</tr>
<tr>
<td>Needing remediation - English</td>
<td></td>
<td>29</td>
<td>9</td>
<td>2.6%</td>
<td>1750</td>
</tr>
<tr>
<td>Needing remediation - Mathematics</td>
<td></td>
<td>45</td>
<td>25</td>
<td>7.2%</td>
<td>2736</td>
</tr>
<tr>
<td>Returned for 2nd Year - same campus</td>
<td></td>
<td>299</td>
<td>106</td>
<td>30.6%</td>
<td>15010</td>
</tr>
</tbody>
</table>

1 % completing ACT is % of students enrolled, not graduates
The UW Freshman Success Report Table describes data analyzed by ACT, Inc. in partnership with the University of Wisconsin System. ACT is an independent, not-for-profit organization that provides assessment, research, information, and program management services in the broad areas of education and workforce development (http://www.act.org/aboutact/index.html). All students entering the UW System’s 26 2-year and 4-year campuses complete the ACT exam as part of their application for admission.

The data presented in the UW System table describe the graduating class of 2003 from XXX High School, and compares their institutional selection and first year performance relative to all 2003 Wisconsin high school graduates entering the UW System in the same academic year. Data for the percent of students completing the ACT exam is reflective of the percent of students enrolled at the time of test administration and not the percent of ACT exams completed by graduates. On average, 68-70% of Wisconsin’s high school graduates complete the ACT exam.

The Freshman Success Reports provide data on the number of enrollments at UW campuses, number of students needing remediation in English or mathematics and the number of students returning for a second year to the same campus. These numbers are only reflective of students who took the ACT exam and then enrolled in a UW campus. Students who attend out-of-state universities, the Wisconsin technical colleges, or independent colleges are not reflected in these data, as well as ACT test takers who chose not to attend college. The Freshman Success Reports were provided to high school principals throughout the state on a periodic basis by the UW System’s Office of Policy Analysis and Research. The most recent analysis of the Freshman Success data was completed in 2005 for the high school class of 2003.

Data Source: High school graduates: http://www2.dpi.state.wi.us/spr

Freshman Success Reports: University of Wisconsin System, Office of Policy Analysis and Research
D2 – Graduates Enrolling in WTCS

<table>
<thead>
<tr>
<th>Percent of HS Grads Enrolling in WTCS</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Directly after High School graduation</td>
<td>24.0%</td>
<td>22.8%</td>
<td>21.3%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Year Out</td>
<td>15.0%</td>
<td>10.4%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Years Out</td>
<td>8.4%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total per graduating class</td>
<td>43.6%</td>
<td>35.7%</td>
<td>23.0%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The Graduates Enrolling in WTCS Table describes the status of each high school graduating class enrolling at any of the 16 Wisconsin Technical College System campuses. Data are presented for the graduating classes of 2002, 2003 and 2004, and document the percent of new and continuing enrollments at a WTCS campus directly following high school, as well as one year and two years after high school completion. These are not cumulative numbers. They represent the enrollment status of each cohort of graduates from the high school, as well as the statewide average for each graduate cohort. High school graduates enrolling in multiple campuses at the same time are counted only once.

The data includes enrollments in occupational, college parallel, adult continuing education or adult basic education programs or courses. These data provide a snapshot of high school graduates’ enrollment and persistence, and offers a statewide comparison that permits educators and others to assess the college-level readiness and success of their graduates.

Data Source: Wisconsin Technical College System reports website
http://systemattic.wtcsystem.org/reports/STW/HighSchoolReports.htm
D3 – Students Enrolling in WTCS Programs

<table>
<thead>
<tr>
<th># of HS Grads Enrolling in WTCS Programs</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biotechnology Laboratory Technician</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electronics</td>
<td>2</td>
<td>6</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Electronics - Computer</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bio-medical Electronics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electronic Engineering Technology</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mechanical Design Technology</td>
<td>8</td>
<td>4</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Civil Engineering Technology</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Architectural Technology; Drafting</td>
<td></td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Electro-Mechanical Technology</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industrial Engineering Technician</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical Engineering Technology</td>
<td>5</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liberal Arts Transfer</td>
<td>14</td>
<td>6</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Enrolled in any program</td>
<td>308</td>
<td>246</td>
<td>221</td>
<td></td>
</tr>
</tbody>
</table>

Increasingly, high school curriculum improvements, such as PLTW, are designed to prepare graduates for success in specific college and career pathways. This indicator describes the number of high school graduates who have enrolled in particular STEM-related programs offered in the WTCS. These numbers do not include WTCS students from the high school who are enrolled but not yet admitted to a program. Students who are completing remedial courses because they lack the pre-requisites for program admission are not reflected in these data.

Data Source: Wisconsin Technical College System reports website
http://systemattic.wtcsystem.edu/webdocs/SASRequests/Client

Reflection Questions: Post-School Outcomes
1. Are PLTW graduates successfully transitioning to higher and postsecondary education institutions?
2. To what extent are PLTW graduates pursuing science, engineering and technology majors in college?
Examining the Evidence: Observations and Recommendations

Are graduates entering and succeeding in the UW System of 2 and 4 year colleges?

**Observations:**
1. The most recent data available from the UW System and ACT, Inc. is for the graduating class of 2003. Of the 129 XXX high school graduates who entered any UW campus (2-year or 4-year), the need for remediation was relatively low for English (7%) but noteworthy for mathematics (19.4%). One in four XXX graduates entering a UW System campus required remedial mathematics instruction after being admitted.

2. Of the 2003 XXX graduates entering the UW System, more than 82% returned for a second year at the campus, compared to the statewide average of 77% for all Wisconsin high schools.

**Action Recommendations:**
1. Develop a task force of high school and local UW and WTCS instructors to examine the alignment of high school mathematics and PLTW courses with the freshman level mathematics proficiencies.

2. Examine *Surveys of Enacted Curriculum* ([www.seconline.org](http://www.seconline.org)) as a possible curriculum alignment resource.
Are graduates entering and succeeding in the WTC System of 2-year colleges?

Observations:
I. Recent data from the Wisconsin Technical College System documents the number of XXX graduates enrolling at one of the 16 WTCS campuses and declaring a specific engineering-related program of study. While some associate degree enrollments are steady or increasing in selected programs (i.e. electronics and architectural technology), other areas (i.e. mechanical design) have decreased in the most recent years.

Action Recommendations:
I. These data suggest that local PLTW leaders should participate actively in local and statewide efforts to articulate PLTW courses with various WTCS Technical Education programs. By increasing and enhancing the number of transcripted credits available at WTCS and UW System campuses, students will have additional incentives to sustain their enrollment in PLTW specialization courses.
REFERENCES


*The educational pipeline: Big investments, big returns.* (Policy Alert) (April, 2004). San Jose, CA: National Center for Public Policy and Higher Education

Appendix A: Eleven Guiding Questions

School and Community Context Questions

A.1 Who attends this school?

A.2 What are the credentials of educators at this school?

A.3 What are the regional science, technology, engineering and mathematics (STEM) career opportunities?

Program Implementation Questions

B.1 Who enrolls in Technology Education and PLTW classes and programs?

B.2 What are the career interests of students at this school?

B.3 Which community resources and postsecondary connections support the program?

Student and School Outcomes Questions

C.1 To what extent are students motivated and engaged by PLTW and technology education instruction?

C.2 To what extent are PLTW and technology education students learning important engineering knowledge, as represented by the end of course assessments?

C.3 To what extent are enrollment increases in technology education and PLTW courses associated with increased academic learning and achievement?

Post-School Outcomes Questions

D.1 Are graduates entering and succeeding in the UW System of 2 and 4 year colleges?

D.2 Are graduates entering and succeeding in the Wisconsin Technical College System (WTCS) of 2-year colleges?
Appendix B: Focus Group Questions

Sample High School Student Focus Group Questions

1. Thinking about this year’s PLTW learning experiences/projects, which was the most interesting, challenging, and fun? Why did you find it to be engaging?
2. Are you using ideas and skills from your PLTW courses in other courses? If yes, please say more.
3. What was your motivation for taking PLTW?
4. Have the PLTW courses increased or changed your level of interest in, or changed your mind about, science, technology, or math?
5. Based on your experiences this year, which science, technology, or math courses do you plan to take next year or sometime in the future? Have you discussed this with your counselor this year?
6. In high school (or college-if appropriate), do you plan to concentrate on studies in engineering, technology or science? If yes, please say more about how you made this decision.
7. What did you like most and least about the PLTW courses this year?
8. What would you like to see changed in the PLTW courses?

Sample High School Teacher/Administration Focus Group Questions

1. From your experiences with the curriculum this year, what aspects of this approach to instruction did you find to be new or different from previously implemented curricula focusing on science and technology?
2. In this school setting, what are the major strengths of the curriculum? What challenges or difficulties does it present?
3. Describe the major impact or effect, if any, you have seen this year on students’ learning of science, technology, English and math concepts and skills.
4. Describe the major impact, if any, you have seen this year on students’ engagement in school and how it is linked to the PLTW curriculum.
5. Describe any changes in your teaching and/or counseling practices that are attributable to the PLTW initiative?
6. What adjustments or changes need to be made in the implementation of the PLTW initiative/program?
Sample Middle School Student Focus Group Questions

1. Thinking about this year’s engineering projects,
   a. which was the most interesting, challenging, and fun?
   b. Why did you find it to be engaging?
2. Are you using ideas and skills from your engineering projects in other courses? If yes, please say more.
3. Have the engineering projects increased or changed your level of interest in science, math, or technology?
   a. Based on your experiences this year, which math, science and technology courses do you plan to take next year or sometime in the future?
   b. Have you discussed this with your counselor this year?
4. Have you talked with your 8th or 9th grade counselor about concentrating your studies in engineering, technology or science?
5. Do you plan to enroll in a high school that offers engineering or Project Lead the Way classes?
6. What did you like most and least about the engineering projects this year?
7. What would you like to see changed in the engineering projects?
   NOTE: Questions 4 and 5 will only be addressed to 8th graders.

Sample Middle School Teacher/Administration Focus Group Questions

1. From your experiences with the curriculum this year, what aspects of this approach to instruction did you find to be new or different from previously implemented curricula focusing on science and technology?
2. In this school setting, what are the major strengths of the curriculum? What challenges or difficulties does it present?
3. Describe the major impact or effect, if any, you have seen this year on students’ learning of math, science and technology concepts and skills.
4. Describe the major impact, if any, you have seen this year on students’ engagement in school and how it is linked to the GTT curriculum.
5. Describe any changes in your teaching and/or counseling practices that are attributable to the GTT initiative?
6. What adjustments or changes need to be made in the implementation of the GTT initiative/program?
7. What logistical issues were involved in the implementation?
APPENDIX C: Reflective Questions

High School Reflective Questions

School and Community Context
1. In what ways is the school population changing?
2. What career and educational planning activities are offered annually to ensure that parents and students are familiar with trends in science and engineering career fields?
3. To what extent has the district maintained and developed a highly qualified faculty in technology, science and mathematics?
4. What skills are students bringing with them?
5. In what ways have the school's graduation requirements changed (i.e. HS credits, M/S, other courses)?
6. Other questions:

Implementation
1. To what extent are enrollments increasing in PLTW courses? Is the participation of female, minority, and low income students growing or declining?
2. How well do PLTW students perform on the end-of-course assessments? To what extent are students completing the college credit end-of-course assessments?
3. To what extent are PLTW students registering with the PLTW national organization to receive college credit? Are students and parents fully aware of the college credit opportunities?
4. What are the recent, significant trends and patterns in math and science course enrollments? Are PLTW students pursuing college preparation level math and science courses?
5. Are PLTW courses attracting and serving female and minority students whose 8th and 10th grade career interest profiles are aligned with engineering and technology careers?
6. In what ways can we strengthen the role(s) of the local industry partnership team in program implementation?
7. To what extent are teachers using common project-based or project-focused learning experiences to align instruction in math, science and technology education classes?
8. Other questions:

Student and Post-School Outcomes
1. To what extent is greater participation in PLTW courses associated with an:
   a. increase in the graduation rate?
   b. increase in the 10th grade WKCE scores?
   c. improvement in student engagement measures (e.g., increased motivation, reporting more impact of school on personal and academic growth, etc.)?
   d. increase in math and science course completion in high school?
2. Do female and minority students enrolled in PLTW courses fare as well as other students in this program?
3. To what extent are PLTW students enrolling in appropriate additional math, science, and technology education courses?
4. Are PLTW graduates successfully transitioning to higher and postsecondary education institutions?
5. To what extent are PLTW graduates pursuing science, engineering and technology majors in college?
6. Other questions:
   Educational Improvement Priorities

Based on these indicators and trends, what are the major school improvement priorities for strengthening pre-engineering and technology education in 2006-07?

Middle School Reflective Questions

School and Community Context
1. In what ways is the school population changing?
2. What career and educational planning activities are offered annually to ensure that parents and students are familiar with trends in science and engineering career fields?
3. To what extent has the district maintained and developed a highly qualified faculty in technology, science and mathematics?
4. What skills are students bringing with them?
5. Other questions:

Implementation
1. To what extent are enrollments increasing in GTT courses? Is the participation of female, minority, and low income students growing or declining?
2. Are GTT students and parents fully aware of the college credit opportunities available through PLTW?
3. Are GTT courses attracting and serving female and minority students whose 8th grade career interest profiles are aligned with engineering and technology careers?
4. In what ways can we strengthen the role(s) of the local industry partnership team in program implementation?
5. To what extent are teachers using common project-based or project-focused learning experiences to align instruction in math, science and technology education classes?
6. Other questions:

Student and Post-School Outcomes
1. To what extent is greater participation in GTT courses associated with an:
   a. increase in the 10th grade WKCE scores?
   b. improvement in student attendance and engagement measures (e.g., increased motivation, reporting more impact of school on personal and academic growth, etc.)?
   c. increase in math and science course completion in high school?
2. Do female and minority students enrolled in GTT courses fare as well as other students in this program?
3. Are GTT graduates successfully transitioning to PLTW in high school?
4. Other questions:
   Educational Improvement Priorities

Based on these indicators and trends, what are the major school improvement priorities for strengthening pre-engineering and technology education in 2006-07?
High School Survey of Student Engagement 2006

Appendix D: High School Survey of Student Engagement Instrument

Thank you for your participation in this survey. These questions cover a wide range of topics related to your high school experience, including your work, your feelings, your beliefs, and your interactions with teachers and other students. Your responses, along with responses from other students, will help your school better understand your needs as a student in order to create a school environment that is engaging, challenging, and productive for you. Please answer thoughtfully and honestly - we appreciate the time and energy you put into this survey.

This survey is managed by the Center for Evaluation & Education Policy, 509 East Third Street, Bloomington, Indiana 47401.

Marking Instructions
- Use black or blue pen or a number 2 pencil.
- Make dark marks that fill the oval completely.
- Do not use pencils that look through the paper.
- Make no stray marks.
- Fill in only one response per question, except where indicated.

1. What grade are you currently in? 9th 10th 11th 12th
2. In what grade did you start attending this high school? 9th 10th 11th 12th
3. How often are you doing each of the following? How important are those activities to you?
   - Number of Hours
   - Not at all
   - A little bit
   - At least important
   - Very important
   - Top priority
   - Doing homework
   - Reading books
   - Reading newspapers, magazines, online articles
   - Participating in school-sponsored activities (clubs, athletics, student government, etc.)
   - Practicing a sport/after-school activity
   - Working for pay (including babysitting and other after-school jobs)
   - Doing volunteer work
   - Exercising
   - Watching television and/or playing video games
   - Surfing or chatting online
   - Hanging out/socializing with friends outside of school

4. How do you feel about the following statements related to your high school?
   a. I feel safe in my school.
   b. I feel good about being in this school.
   c. I feel proud of my school.
   d. I feel respected by my teachers.
   e. My teachers care about me.
   f. There is at least one adult in my school who cares about me and knows me well.

5. How do you feel about the following statements related to your high school?
   a. I believe that my school is doing a good job of teaching me the skills I need.
   b. I believe that my school is doing a good job of teaching me the skills I need to succeed in the future.
   c. I believe that my school is doing a good job of teaching me the skills I need to succeed in the future.
   d. I believe that my school is doing a good job of teaching me the skills I need to succeed in the future.
   e. I believe that my school is doing a good job of teaching me the skills I need to succeed in the future.
   f. I believe that my school is doing a good job of teaching me the skills I need to succeed in the future.
   g. I believe that my school is doing a good job of teaching me the skills I need to succeed in the future.
   h. I believe that my school is doing a good job of teaching me the skills I need to succeed in the future.
   i. I believe that my school is doing a good job of teaching me the skills I need to succeed in the future.
   j. I believe that my school is doing a good job of teaching me the skills I need to succeed in the future.
   k. I believe that my school is doing a good job of teaching me the skills I need to succeed in the future.
   l. I believe that my school is doing a good job of teaching me the skills I need to succeed in the future.
   m. I believe that my school is doing a good job of teaching me the skills I need to succeed in the future.
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   o. I believe that my school is doing a good job of teaching me the skills I need to succeed in the future.
   p. I believe that my school is doing a good job of teaching me the skills I need to succeed in the future.
   q. I believe that my school is doing a good job of teaching me the skills I need to succeed in the future.
   r. I believe that my school is doing a good job of teaching me the skills I need to succeed in the future.
   s. I believe that my school is doing a good job of teaching me the skills I need to succeed in the future.
   t. I believe that my school is doing a good job of teaching me the skills I need to succeed in the future.
   u. I believe that my school is doing a good job of teaching me the skills I need to succeed in the future.
   v. I believe that my school is doing a good job of teaching me the skills I need to succeed in the future.
   w. I believe that my school is doing a good job of teaching me the skills I need to succeed in the future.
   x. I believe that my school is doing a good job of teaching me the skills I need to succeed in the future.
   y. I believe that my school is doing a good job of teaching me the skills I need to succeed in the future.
   z. I believe that my school is doing a good job of teaching me the skills I need to succeed in the future.

6. How do you feel about the following statements related to your high school?
   a. I believe that my school is doing a good job of teaching me the skills I need to succeed in the future.
   b. I believe that my school is doing a good job of teaching me the skills I need to succeed in the future.
   c. I believe that my school is doing a good job of teaching me the skills I need to succeed in the future.
   d. I believe that my school is doing a good job of teaching me the skills I need to succeed in the future.
   e. I believe that my school is doing a good job of teaching me the skills I need to succeed in the future.
   f. I believe that my school is doing a good job of teaching me the skills I need to succeed in the future.
   g. I believe that my school is doing a good job of teaching me the skills I need to succeed in the future.
   h. I believe that my school is doing a good job of teaching me the skills I need to succeed in the future.
   i. I believe that my school is doing a good job of teaching me the skills I need to succeed in the future.
   j. I believe that my school is doing a good job of teaching me the skills I need to succeed in the future.
   k. I believe that my school is doing a good job of teaching me the skills I need to succeed in the future.
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   m. I believe that my school is doing a good job of teaching me the skills I need to succeed in the future.
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   o. I believe that my school is doing a good job of teaching me the skills I need to succeed in the future.
   p. I believe that my school is doing a good job of teaching me the skills I need to succeed in the future.
   q. I believe that my school is doing a good job of teaching me the skills I need to succeed in the future.
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   x. I believe that my school is doing a good job of teaching me the skills I need to succeed in the future.
   y. I believe that my school is doing a good job of teaching me the skills I need to succeed in the future.
   z. I believe that my school is doing a good job of teaching me the skills I need to succeed in the future.

7. During this school year, how often have you done each of the following?
   a. Asked questions in class
   b. Answered questions in class
   c. Talked to a teacher about your class work
   d. Made a class presentation
   e. Prepared a draft of a paper or assignment before turning it in
   f. Wrote a paper off the books
   g. Wrote a paper that was not plagiarized
   h. Received helpful/constructive feedback from teachers on assignments or other class work
   i. Attended class with all assignments completed
   j. Attended class with all assignments completed
   k. Worked on a paper or project that required you to do research outside of assigned text (books, articles, interviews, internet, etc.)
   l. Worked on any writing assignments or other class work
   m. Worked with other students on projects/assignments during or outside of class
   n. Discussed questions or ideas with other students
   o. Took a test in class with multiple-choice questions created by your teacher
   p. Took a test in class with essay questions or show-your-work problems created by your teacher
   q. Talked to a teacher about your class work
   r. Talked to a classmate about your class work
   s. Talked to a teacher about your class work
   t. Talked to a classmate about your class work
   u. Talked to a classmate about your class work
   v. Talked to a classmate about your class work
   w. Talked to a classmate about your class work
   x. Talked to a classmate about your class work
   y. Talked to a classmate about your class work
   z. Talked to a classmate about your class work

8. How do you feel about the following statements related to your beliefs about working and learning?
   a. I value my school.
   b. I value my school.
   c. I value my school.
   d. I value my school.
   e. I value my school.
   f. I value my school.
   g. I value my school.
   h. I value my school.
   i. I value my school.
   j. I value my school.
   k. I value my school.
   l. I value my school.
   m. I value my school.
   n. I value my school.
   o. I value my school.
   p. I value my school.
   q. I value my school.
   r. I value my school.
   s. I value my school.
   t. I value my school.
   u. I value my school.
   v. I value my school.
   w. I value my school.
   x. I value my school.
   y. I value my school.
   z. I value my school.

9. How do you feel about the following statements related to your beliefs about working and learning?
   a. I value my school.
   b. I value my school.
   c. I value my school.
   d. I value my school.
   e. I value my school.
   f. I value my school.
   g. I value my school.
   h. I value my school.
   i. I value my school.
   j. I value my school.
   k. I value my school.
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   o. I value my school.
   p. I value my school.
   q. I value my school.
   r. I value my school.
   s. I value my school.
   t. I value my school.
   u. I value my school.
   v. I value my school.
   w. I value my school.
   x. I value my school.
   y. I value my school.
   z. I value my school.
### 16. To what extent do you believe your high school encourages students to do all of the following?

<table>
<thead>
<tr>
<th>Very Little</th>
<th>Some</th>
<th>Quite a bit</th>
<th>Very Much</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Spend a lot of time studying and doing school work</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Spend a lot of time preparing for state and district standardized tests</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Participate in school events and activities (athletics, plays, etc)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Use computers for class work</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. Explore new ideas</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. Continues schooling beyond high school (college, career training, etc)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 17. Which of the following have you done during high school?

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Participated in community service or volunteer work</td>
<td></td>
</tr>
<tr>
<td>b. Participated in a study-abroad program</td>
<td></td>
</tr>
<tr>
<td>c. Taken the SAT, ACT, or other</td>
<td></td>
</tr>
<tr>
<td>d. Received tutoring from an individual or organization outside of school</td>
<td></td>
</tr>
<tr>
<td>e. Completed one or more Advanced Placement (AP) courses</td>
<td></td>
</tr>
<tr>
<td>f. Participated in an International Baccalaureate (IB) program</td>
<td></td>
</tr>
</tbody>
</table>

### 18. Why do you go to school? Fill in all that apply.

- Because I enjoy being in school
- Because I want to succeed
- Because I want to acquire skills for the workplace
- Because I need to work to support my family
- Because I need to go to college
- To stay out of trouble
- For other reasons

### 19. Have you ever skipped school?

- Never
- Once or twice
- More than twice

### 20. Have you ever considered dropping out of high school?

- Never
- Once or twice
- Many times

### 21. If you have thought about dropping out of high school, why? Fill in all that apply.

- The work was too hard
- I didn't like the school
- I didn't like the teachers
- I didn't like the work
- I was picked on or bullied
- I needed to work for money
- My family issues
- Other

### 22. Have you ever been held back a grade level in school?

- Never
- Once or twice
- More than twice

### 23. Do you believe you are in danger of being held back a grade level this year?

- Never
- Once or twice
- More than twice

### 24. Have you ever been bored in class in high school?

- Never
- Once or twice
- More than twice

### 25. If you have been bored in class, why? Fill in all that apply.

- Work wasn't challenging enough
- Work was too difficult
- Material wasn't interesting
- Material wasn't relevant to me
- No interaction with teacher
- Other

### 26. To what degree does each of the following types of work in class excite and/or engage you?

- Teacher lecture
- Discussion and debate
- Individual reading
- Writing projects
- Research projects
- Group projects
- Presentations
- Role plays
- Art and drama activities

### 27. What language is spoken in your home?

- English, mainly
- Another language, mainly - specify language
- More than one language - specify languages

### 28. Were you born in the United States?

- No
- Yes

### 29. How do you identify yourself by race and/or ethnicity? Fill in all that apply.

- American Indian, Alaska Native, Native Hawaiian, or other Native American
- Asian, Asian American, or Pacific Islander
- Black, African, African American, or of Caribbean origin
- Latino, Hispanic, or of Spanish origin
- Middle Eastern
- White, White American, or European
- Prefer not to respond

### 30. Are you eligible to receive free or reduced-price lunch at your high school?

- No
- Yes
- Don't know/Prefers not to answer

### 31. How far do you want to go in your schooling, and what is the highest level of schooling that your parent(s) or guardian(s) completed?

- Did not finish high school
- High school diploma or GED
- Some college (Associate's Degree)
- Four-year college degree (Bachelor's Degree)
- Master's degree
- Doctorate or other advanced professional degree (Ph.D., Ed.D, law or medical degree, etc)
- Don't know/Not applicable

### 32. How would you describe most of your high school grades? For ninth graders, include middle school grades.

- Mostly As
- Mostly As and Bs
- Mostly Bs and Cs
- Mostly Cs and Ds
- Mostly Ds and below

### 33. Which of the following categories describes your academic track or most of the classes that you take?

- Current/Vocational
- General/Regular
- Honors/College Preparatory/Advanced
- Special Education
- Don't Know

### 34. Would you like to say more about any of your answers to these survey questions? Please do so in the space provided here.

- [Space for additional comments]