

Ensuring College and Career Readiness for SCIENCE, TECHNOLOGY, ENGINEERING AND MATHEMATICS (STEM):



INDICATORS OF
STUDENT LEARNING
AND ENGAGEMENT

Profile: Appleton East HS



THE CENTER ON
EDUCATION AND WORK
University of Wisconsin-Madison

Contents

Data Profiles

| | |
|--------------------|-----|
| PLTW Participation | 5-6 |
| Demographics Data | 7-8 |

Academic Outcomes

| | |
|---|-------|
| (1) Attendance and Grade Point Average | 9-10 |
| (2) 10th Grade Academic Proficiency | 11-12 |
| (3) Average Number of Math and Science Credits in High School | 13-14 |
| (4) Math and Science Credits in the 12th Grade | 15-16 |
| (5) ACT Participation and Composite Score | 17-18 |
| (6) ACT Math and Science Scores | 19-20 |

College Readiness Indicators

| | |
|---|-------|
| (7) Intellectual Openness and Inquisitiveness | 21-22 |
| (8) Reasoning, Interpretation and Analysis | 23-24 |
| (9) Oral and Written Communications | 25-26 |
| (10) Problem Solving, Critical Thinking, and Teamwork | 27-28 |

Career Readiness Indicators

| | |
|--|-------|
| (11) Career Exploration and College/Career Planning | 29-30 |
| (12) IT Applications and Creativity | 31-32 |
| (13) Diversity and Social Responsibility | 33-34 |
| (14) Professionalism/Work Ethic and Self Direction/Lifelong Learning | 35-36 |

| | |
|------------------|-------|
| End Notes | 37-38 |
|------------------|-------|

Acknowledgements:

This project was conducted with the generous support of the Kern Family foundation and the Greater Milwaukee Foundation. Our project officers, Karen Wilken (KFF) and Jane Moore (GMF), provided valuable insight and encouragement throughout all aspects of the study. We are deeply indebted to administrative team and faculty members at TESLA and Appleton East High School who provided access to students, classroom, and data sets. More specifically, Ben Vogel (principal), Matt Mineau (associate principal), and Dale Hanson (director of career and technical education) offered significant leadership in planning and implementing the HSSSE survey and in accessing the student record data. Sean Schuff and Nick German, TESLA faculty members, provided access to students for interviews and answered an endless set of questions. The recently conducted briefing session with staff and TESLA Board members was helpful in refining this report. We hope this report is useful in your continuing efforts to provide challenging learning experiences that enable students to succeed in college and life beyond high school.

Authors:

L. Allen Phelps, Professor and Director, Center on Education and Work
Eric Camburn, Assistant Professor, Educational Leadership and Policy Analysis
Julie Durham, Research Associate and Project Manager, Center on Education and Work

Design: Randi Strand :: **Production:** Julie Raasch

Executive Summary

In response to the global economy and the nation's rising economic challenges, America's high schools — working closely with their local business partners — are responding rapidly to the call for ensuring that all students are college and career ready upon graduation. One of the key missions of the Appleton Area School District is to address the needs of all learners and provide graduating students with the skills and knowledge to successfully pursue higher education essential for their chosen career paths.

By 2016, 80% of Wisconsin's fastest growing jobs will require postsecondary education. However, at present only 38% of adults in hold a 2-year or 4-year degree. According to the Wisconsin Department of Workforce Development projections, over the next decade the 7-county Fox Valley workforce area will require:

- 21% increase in industrial engineers (20 openings annually);
- 33% increase in computer software engineers (30 openings annually); and
- 10% increase in civil engineers (20 new positions annually)

In response to significant changes in the local economy, in 2001 community and school leaders decided to open the four-year TESLA Engineering Charter School at Appleton East High School. Named for Nikola Tesla--the inventor of radio—and opened in 2002, TESLA enrollment has grown steadily, and now serves more than 100 students annually from Appleton High Schools and several surrounding school districts.

At TESLA students enroll in the Project Lead the Way (PLTW) pre-college engineering curriculum—a standards-aligned, project and problem-based

curriculum that offers students real world learning experiences. If students score well on the rigorous end of course exams, they can earn college credit or advanced standing in engineering colleges in Wisconsin and nationally.

In May 2008, 347 Appleton East seniors completed the High School Survey of Student Engagement (HSSSE). Annually, this nationally prominent survey is used by approximately 125 high schools across 26 states to assess the implementation and effectiveness of the high school teaching and learning innovations. Nearly 85,000 students provided data describing their academic, social, and personal engagement with the teaching and learning experiences at their schools. Of the 347 Appleton East seniors, 27 had completed one or more engineering courses offered by the TESLA Engineering Charter School.

In this data book we use information from the HSSSE and de-identified student data from the Appleton Area School District to tell TESLA's important story. Three critical questions are addressed in this case study:

Compared to their peers,

- (1) To what extent are Appleton East seniors, seniors who enrolled in PLTW classes better off academically?
- (2) To what extent are Appleton East seniors completing PLTW courses ready for college?
- (3) To what extent are Appleton East seniors completing PLTW courses ready for careers?

KEY FINDINGS:

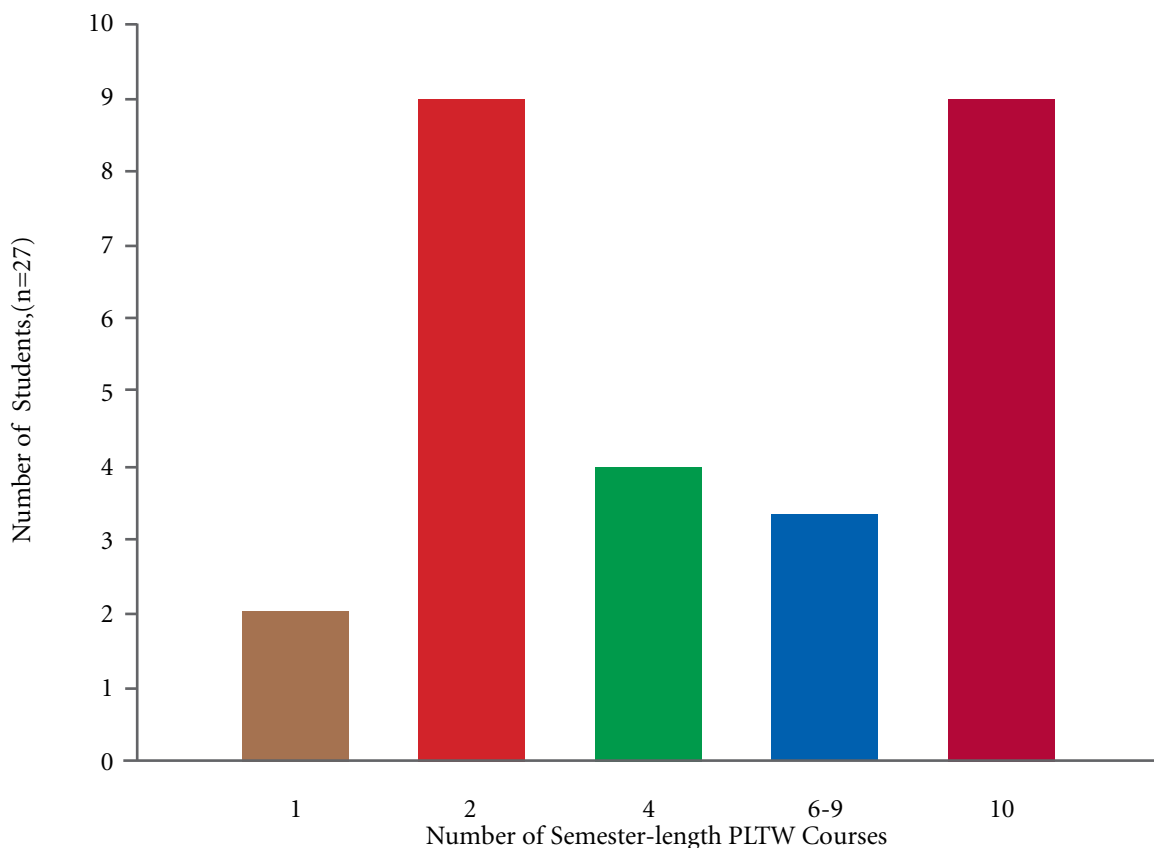
- (1) The 2008 Appleton East seniors completing one or more Project Lead the Way courses were significantly more likely ($p < .01$) to score higher on their ACT exams than their peers who had not completed PLTW courses. After controlling for selected variables that could influence their ACT outcome (such as family income and prior academic performance), this difference remains intact. The TESLA graduates' mean composite ACT score was 26.7—a score that is above the admission requirement for Engineering majors at universities with selective admission standards.
- (2) TESLA/PLTW seniors also recorded significantly higher ACT – Mathematics sub-scores ($p < .05$) than their peers.
- (3) On measures of college readiness, the TESLA/PLTW seniors report significantly higher levels of intellectual openness ($p < .001$), such as discussing open ended questions and being motivated by a desire to learn.
- (4) The TESLA/PLTW seniors report being more proactively pursuing career exploration activities ($p < .05$) than their peers, including talking with adults about career goals and participating in school experiences that help them clearly define career goals.

To continue improving and expanding the impact and quality of TESLA Engineering Charter School/Academy, two recommendations are offered:

- (1) High school learning experiences, along with changes in instruction and counseling practices, should be focused specifically on both the academic outcomes and the career and college readiness indicators identified herein. For example, to improve the graduation rate for girls in TESLA, a number of changes could be considered such as expanding the Summer Engineering Camp for girls or adding the biotechnical engineering course. To improve scores on the “teamwork and collaboration” college readiness indicator, the number of student team assignments in the engineering courses could be expanded.
- (2) Compile and analyze longitudinal data on the graduates of TESLA so that: (a) instructional improvements can be made to enhance graduates' success in college as well as engineering or technical careers, and (b) educators, parents, taxpayers, students, and the public has a clear picture of the impact of TESLA on student success beyond high school.

Data Profile: PLTW Participation

Number of Engineering Courses Completed



Engineering Course Enrollment by Grade

| | POE | IED | DE | CIM | EDD | Total |
|--------------|-----------|-----------|-----------|-----------|-----------|-----------|
| 9th grade | | 7 | | | | 7 |
| 10th grade | 10 | 3 | | | | 13 |
| 11th grade | 5 | 4 | 14 | 10 | | 33 |
| 12th grade | 2 | 5 | 4 | 3 | 10 | 24 |
| Total | 17 | 19 | 18 | 13 | 10 | 77 |

All courses at Appleton East are 5 credits per semester with the exception of EDD, which is a year-long two-period engineering design course

| | PLTW Seniors | Non PLTW Seniors | Total |
|------------------------|--------------|------------------|------------|
| Completed the HSSSE | 19 | 226 | 245 |
| Did not take the HSSSE | 8 | 94 | 102 |
| Total | 27 | 320 | 347 |

Notes: This study did not include seniors attending TESLA from other high schools. Only 19 of 27 PLTW seniors completed the HSSSE, so the sample of PLTW students represented in the college and career readiness data is relatively small.

Student's Perspectives Regarding TESLA

... most of us are looking for something above and beyond. None of us really fit the normal student who just wants to get done with high school and get out of here. Most of us want to learn.

... TESLA has helped because a lot of us want to go into engineering ... and because of TESLA we are pointed in a direction versus just going to college and not having a focus.

I was originally thinking like civil engineering, but now, I'm doing electrical.

KEY FINDINGS:

- (1) Of the 27 graduates from the Class of 2008 who completed PLTW courses, some were exploring engineering while others were concentrating their studies. Eleven students had completed one or two semester-long courses, while 16 graduates had completed between 4 -10 semester-long courses
- (2) Most students enrolled in TESLA's PLTW courses during the 11th and 12th grades. However, those concentrating on engineering studies began in 10th grade. The concentrators tended to complete the Digital Electronics, Computer Integrated Manufacturing, and Engineering Design and Development courses
- (3) Each of the PLTW courses offered at TESLA have an equal appeal for students, which indicates that TESLA seniors are gaining a broad understanding of engineering foundations, applications, and specializations

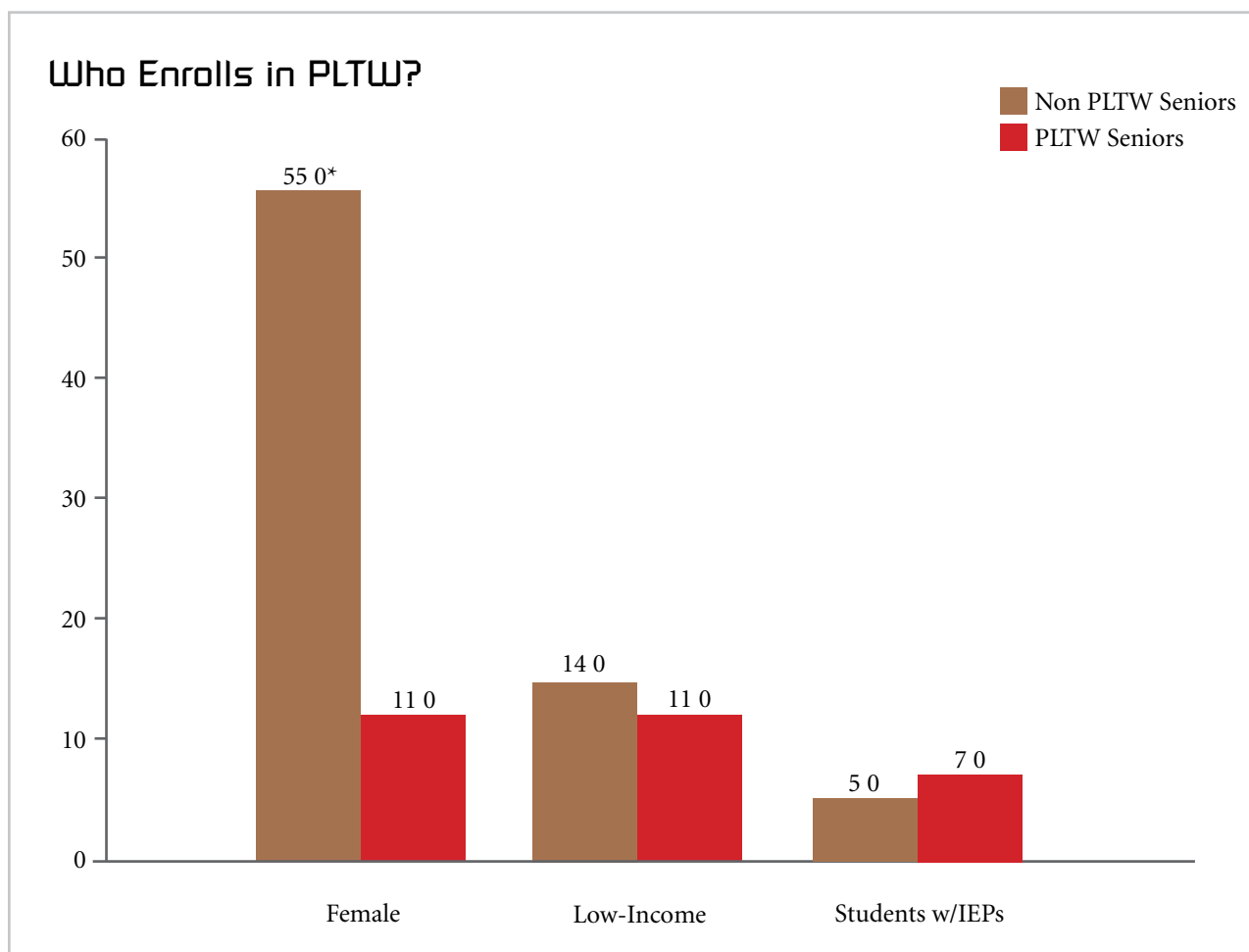
Research Evidence

In 2004, only 3.4% of America's high school graduates had completed both an academic and career concentration in high school ³

Next Steps:

A large rectangular area with a grey header containing the text "Next Steps:". Below the header are ten horizontal dotted lines for writing. To the right of the bottom of this area is a vertical column containing a downward-pointing triangle, the number "6", and an upward-pointing triangle.

Data Profile: Demographic Data



KEY FINDINGS:

- (1) Young women in the Appleton East Class of 2008 were significantly less likely to complete PLTW courses during high school
- (2) When compared to their peers, two groups of seniors—those from low income families and seniors with disabilities—were equally likely to enroll in and complete PLTW courses during their high school careers

Research Evidence

According to the National Science Foundation, women completed a larger share of the bachelor's and associate's degrees awarded by U S colleges However, the percentage of women receiving degrees in the STEM fields was 38-46% lower than the overall averages Previous research suggests that completion of advanced science and math courses in high school is associated with the pursuit of STEM college majors by young women

- 57 8% of all bachelor degrees in 2006
- 50 5% of all STEM bachelor degrees
- 19 5% of all Engineering bachelor degrees

- 61 9% of all associate degrees in 2006
- 40 6% of all STEM associate degrees
- 14 8% of all Engineering associate degrees
- 15 7% of all Engineering Technology degrees ⁴

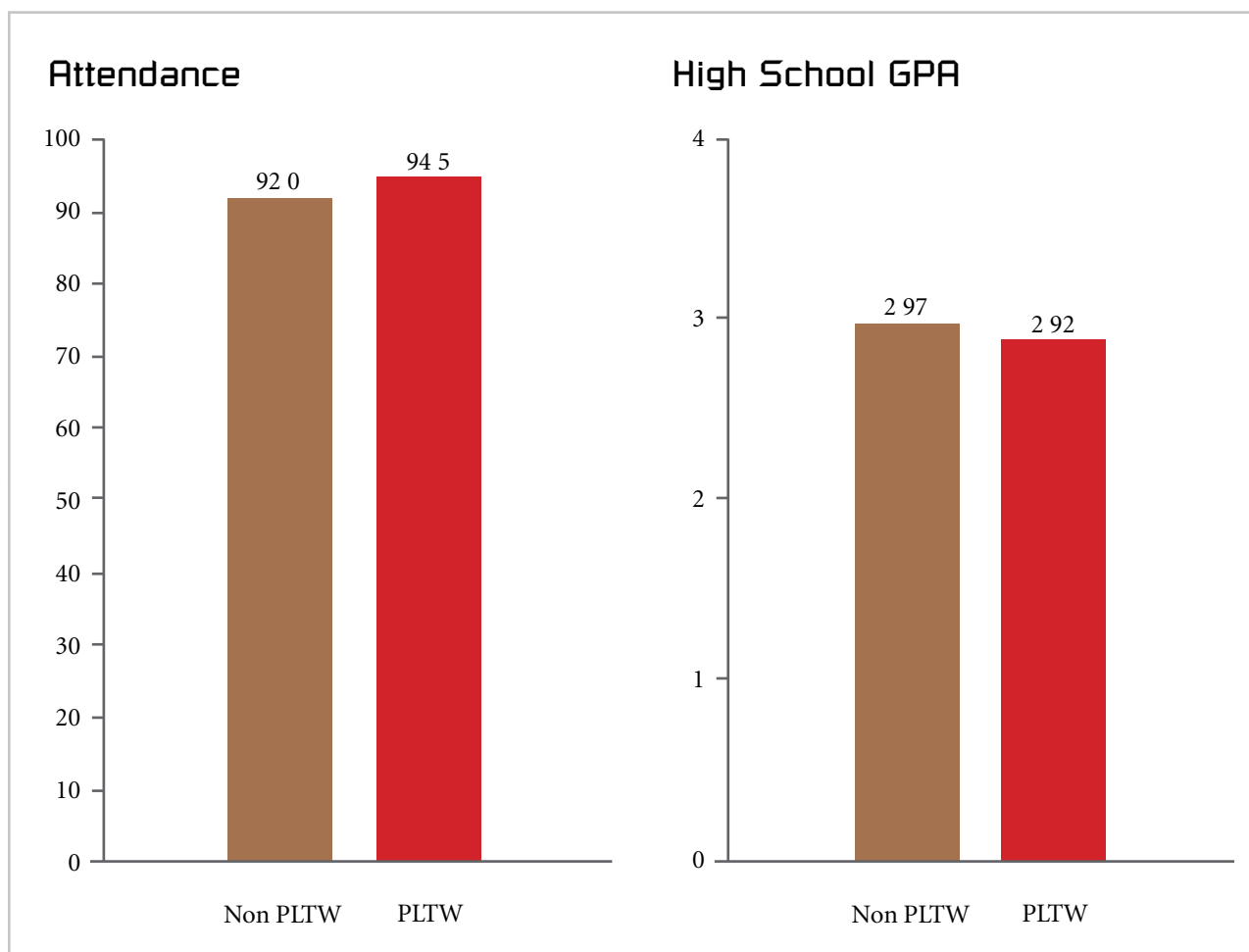
Teachers can promote positive beliefs regarding women's abilities by exposing students to female role models who have succeeded in math and science Field trips to workplaces and guest speakers at school can start a dialogue between students and professionals about women's careers and the use of math and science in those professions

Source: U S Department of Education Doing What Works Clearinghouse ⁵

Next Steps:

A large rectangular area with a grey header containing the text "Next Steps:". Below the header is a series of horizontal dotted lines for writing.

Data Profile: Academic Outcomes



KEY FINDINGS:

Attendance during the senior year and grades are key indicators of student engagement and post high school success in career and college settings. At Appleton East, the TESLA/PLTW seniors have a higher attendance rate and a comparable grade point average when compared to other seniors. On both indicators, TESLA/PLTW seniors do not demonstrate significantly higher performance.

The First Robotics competition fosters a commitment to professionalism and work ethics. As one student commented . . . At the end of the semester the labs are always open. When Robotics is going on we are in here most Saturdays and some Sundays, and after school too.

Research Evidence

In a 2006⁶ update of the *Toolbox Revisited: What Counts in Bachelor's Degree Completion*, Adelman finds that:

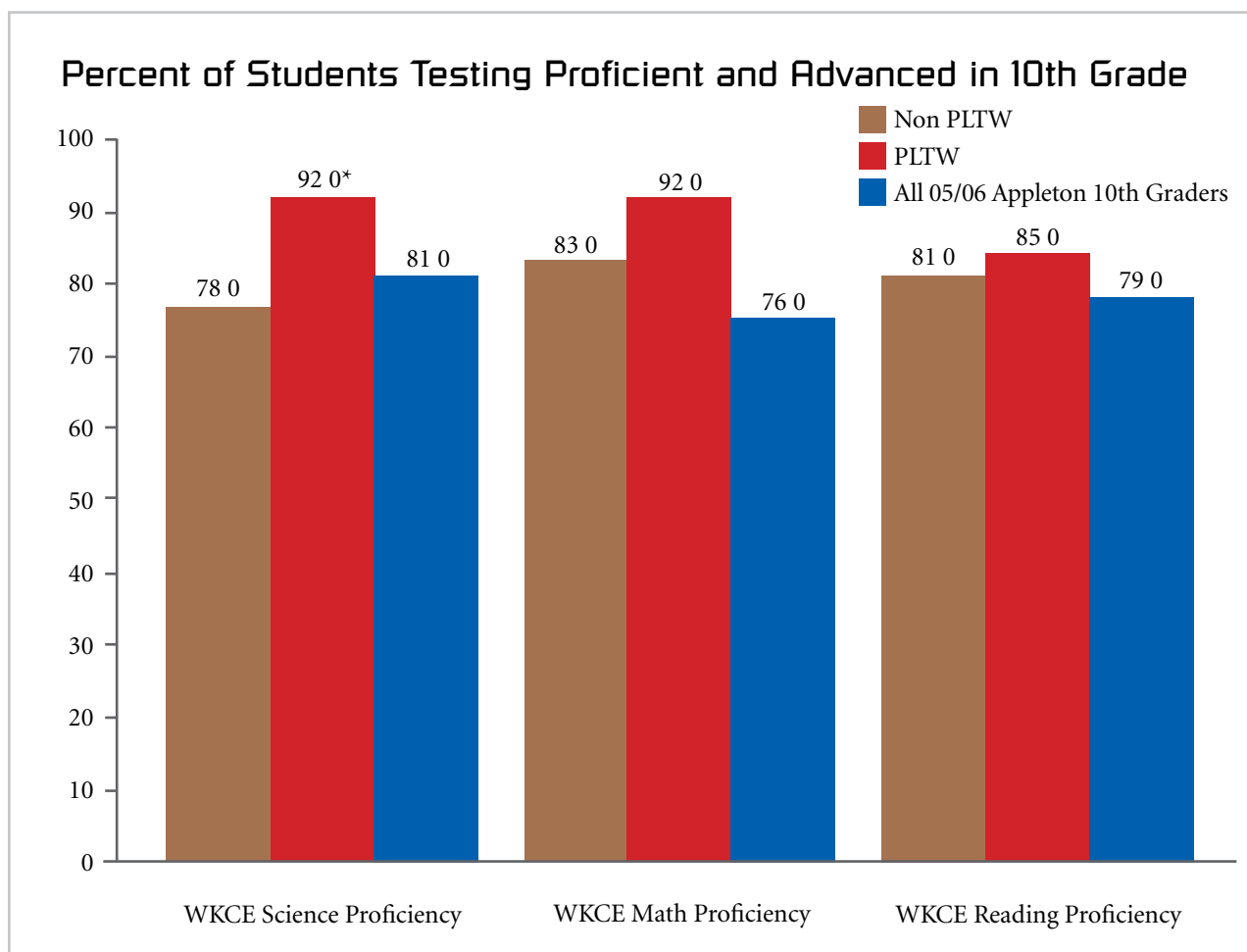
- The academic intensity of a high school curriculum counts even more than it did in the original Tool Box study, as do high school grades/class rank
- Some demographic information is significant in predicting who completes a degree, such as parents' attendance at college, race/ethnicity, family income and gender

In a 2006 Conference Board Report⁷, a sample of 400 U S employers were asked to describe the most important skills needed by new workforce entrants Professionalism and work ethic was listed as one of the five most important characteristics According to leading employers, demonstrating personal accountability and punctuality is extremely important

Next Steps:

A large rectangular area with a grey header containing the text "Next Steps:". Below the header are approximately 15 horizontal dotted lines for writing.

Data Profile: Academic Outcomes



KEY FINDINGS:

Students can enroll in PLTW courses at TESLA as early as the 9th grade. On the 10th grade state assessments, the 2008 PLTW seniors scored significantly higher ($p < 10$) than all other seniors on the science examination.

There are several possible interpretations of this relationship:

- (1) The Appleton seniors who excelled in science were attracted to the PLTW courses at some point in their high school experience.
- (2) The content of middle school science courses, or PLTW and/or science courses completed during the freshman year, may have enhanced students' science knowledge.
- (3) Informal science learning in summer or after school programs, such as the First Robotics competition, may be indirectly influencing students' science learning in 8th and 9th grade.

Research Evidence

In urban high schools serving low income and minority students, the freshman year is particularly challenging. A recent longitudinal study of three high schools using transition academies revealed that a mix of one career and technical education course for each academic course significantly reduced the likelihood of dropping out for freshman who were under 15 when entering high school ⁸

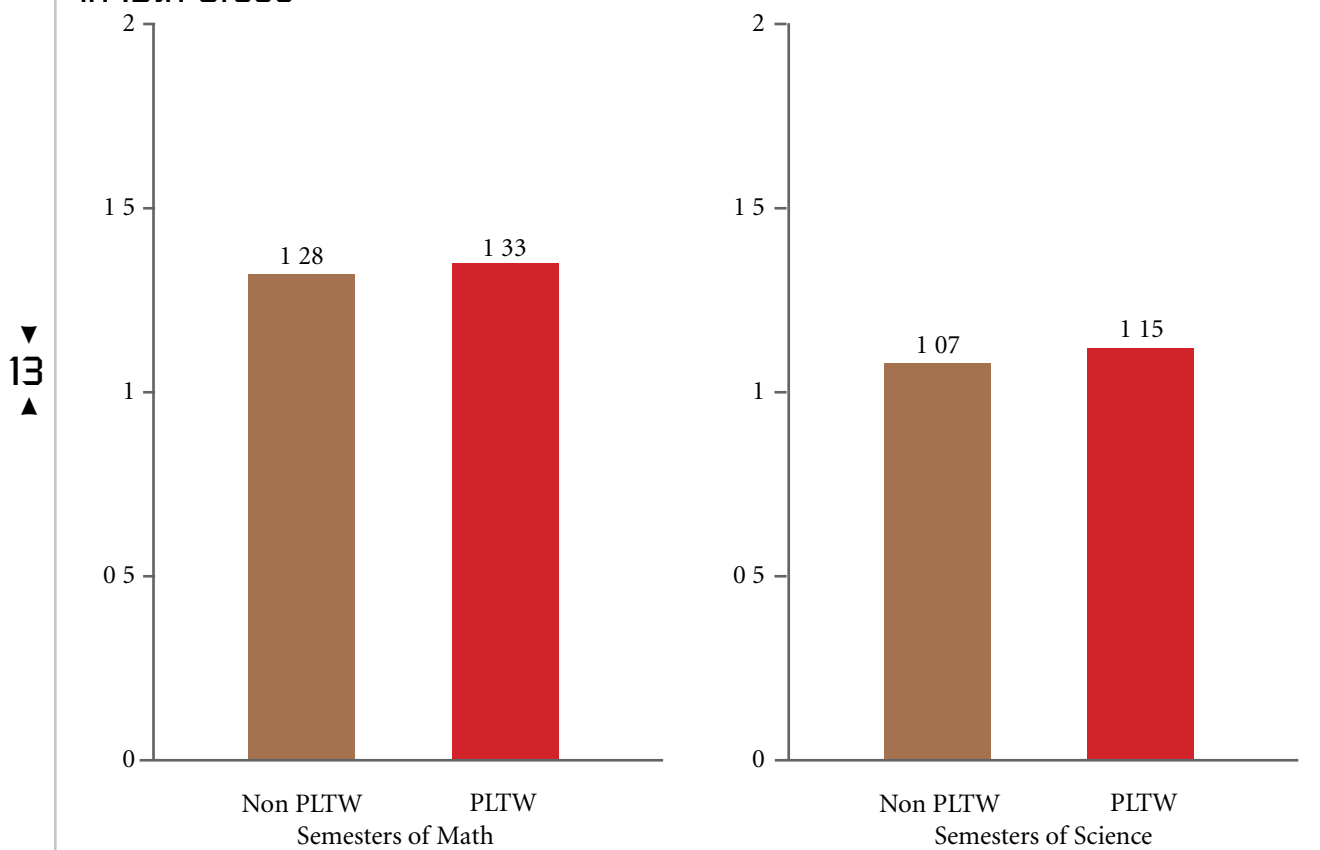
The Indiana Career and Postsecondary Advancement Center (2002) found that having a career plan by the beginning of the high school junior year is associated with better grades, participation in more academically rigorous curricula, and a greater likelihood of expecting to complete four or more years of postsecondary education. Latino students who have completed career plans are twice as likely to expect to complete four or more years of college as Latino students without career plans. For all groups of students, having a career plan is associated with higher levels of educational expectations ⁹

Next Steps:

A large rectangular area with a grey header containing the text "Next Steps:". Below the header are approximately 18 horizontal dotted lines for writing.

Data Profile: Academic Outcomes

Average Number of Semesters of Math and Science Credits Taken in 12th Grade



KEY FINDINGS:

During their senior year both PLTW and non-PLTW seniors were completing about 1.3 semester credits in math and 1.1 semester credits in science courses. While there were no significant differences between the groups in 12th grade math and science course completion, these data indicate that seniors, faculty, and guidance counselors recognize the importance of advanced academic coursework during the final year of high school.

While the Appleton East graduation requirements includes two credits in math and two credits in science, each of the TESLA senior focus group participants indicated they had completed four or five math and science courses.

Research Evidence

A recent report from ACT (2007, 23-24) confirms earlier findings related to ACT course taking: “Overall trends were similar: higher level mathematics and science courses corresponded to greater average increases in ACT Mathematics and Science scores, compared to lower-level courses”

Source: http://www.act.org/research/reports/pdf/ACT_RR2007-2.pdf

A 2008 report from the National Center for Education Statistics examines course taking trends by the 2004 high school seniors and found:

13% of 2004 seniors completed calculus

34% completed a math course

25% completed an advanced science course

Source: <http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2008320>

According to a national high school transcript analysis students who concentrated in CTE courses (2-4 occupational credits) completed:

- 3.7 credits in mathematics

- 3.4 credits in science

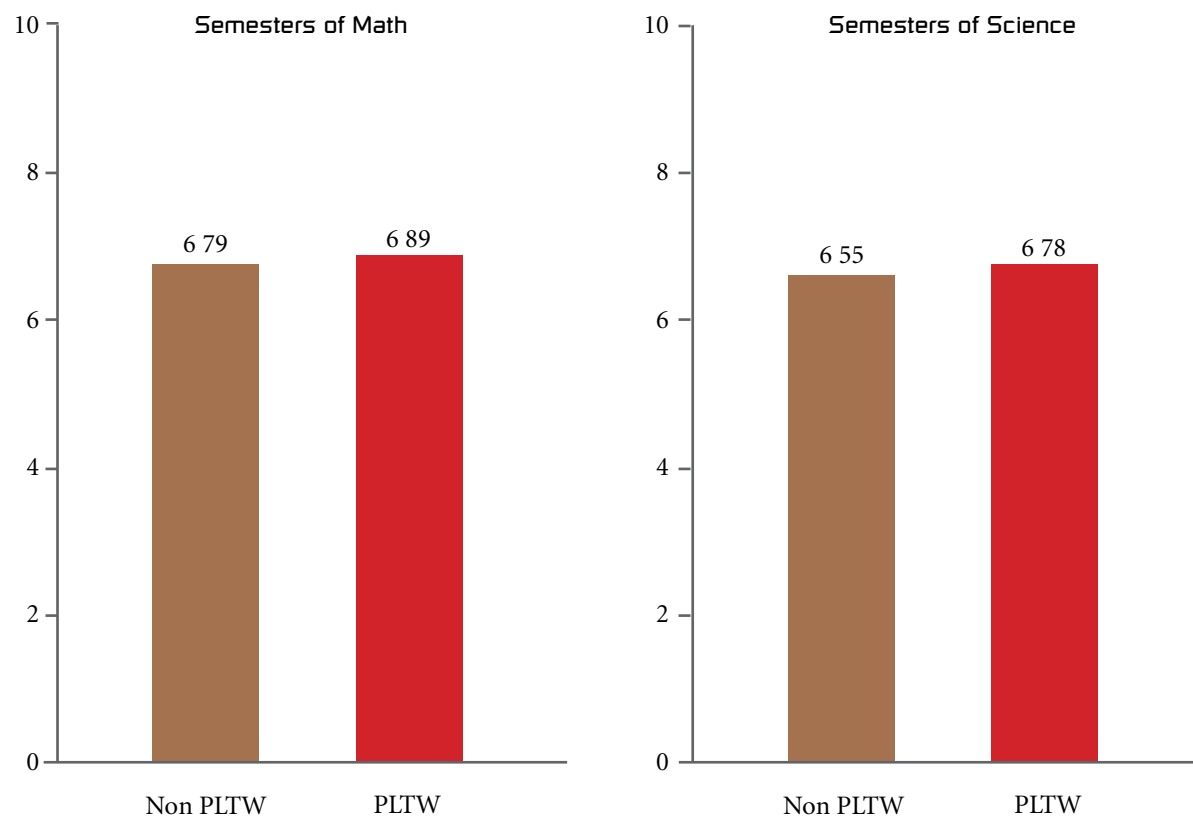
Source: <http://nces.ed.gov/pubs2008/2008035.pdf>

Next Steps:

A large rectangular area with a grey header containing the text "Next Steps:" and the rest of the area filled with horizontal dotted lines for writing.

Data Profile: Academic Outcomes

Average number of Semesters of Math and Science Taken in High School



KEY FINDINGS:

Overall, the Appleton East seniors and PLTW seniors are completing comparable, high levels of math and science courses during high school. On average both groups are completing more than 6.5 math and science credits, which suggests TESLA and other Appleton East graduates will likely do well in college.

The First Robotics competition fosters a commitment to professionalism and work ethics. As one student commented . . . At the end of the semester the labs are always open. When Robotics is going on we are in here most Saturdays and some Sundays, and after school too.

Research Evidence

In a 2006 update of the Toolbox Revisited: What Counts in Bachelor's Degree Completion, Adelman⁶ finds that:

- The combination of getting beyond Algebra 2 in math and taking three Carnegie Units in core laboratory science (biology, chemistry, physics) is more critical than taking three units in foreign language or Advanced Placement classes, even though Advanced Placement courses contribute to the highest level of academic intensity in a high school curriculum
- Of students who completed a high school curriculum at the highest levels of academic intensity in high school (the report measures 31 levels), 95% earned a bachelor's degree

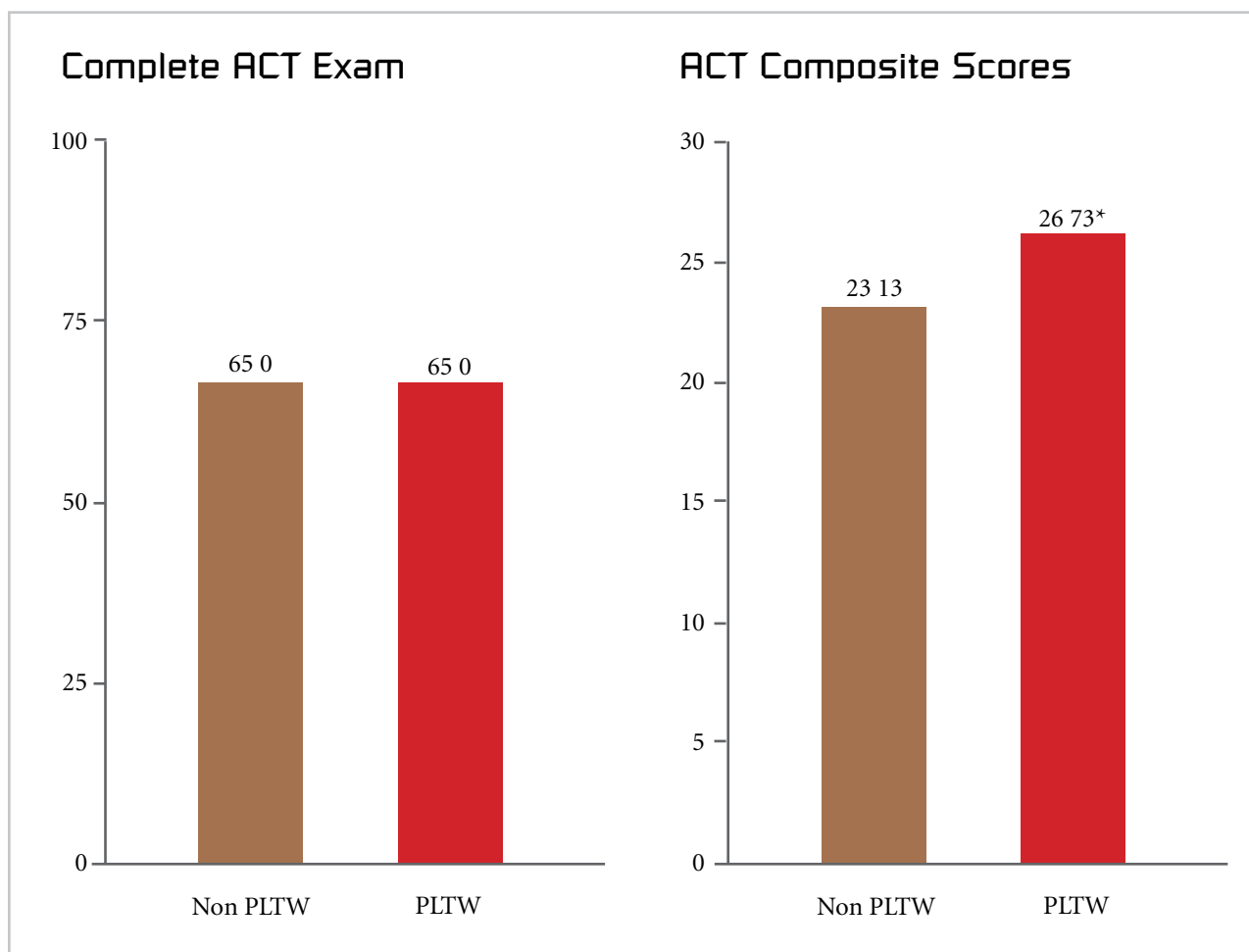
A recent report from ACT (2007, 23-24) confirms earlier findings related to ACT course taking: "Overall trends were similar: higher level mathematics and science courses corresponded to greater average increases in ACT Mathematics and Science scores, compared to lower-level courses"

Source: http://www.act.org/research/reports/pdf/ACT_RR2007-2.pdf

Next Steps:

A large rectangular area with a grey header containing the text "Next Steps:" and the rest of the area filled with horizontal dotted lines for writing.

Data Profile: Academic Outcomes



KEY FINDINGS:

The PLTW seniors are significantly out-performing their peers on the ACT examination overall ($p < .01$). For this typical cohort of seniors, which included 14% from poor families, completing PLTW courses was a strong indicator for generating ACT scores in the 26-27 range. Generally, ACT composite scores above 26 are required for admission to engineering programs at selective universities.

Research Evidence

A recent report from ACT (2007, 23-24) confirms earlier findings related to ACT course taking: “Overall trends were similar: higher level mathematics and science courses corresponded to greater average increases in ACT Mathematics and Science scores, compared to lower-level courses”

Source: http://www.act.org/research/reports/pdf/ACT_RR2007-2.pdf

Higher ACT math scores (~25.8 and above) were a significant predictor for students who completed bachelor’s degrees in engineering, compared to those who changed majors or dropped out. No differences in retention outcomes were found based on gender, race/ethnicity, and SES status of the engineering students (Leuwerke, Robbins, Sawyer & Holland, 2004) ⁹

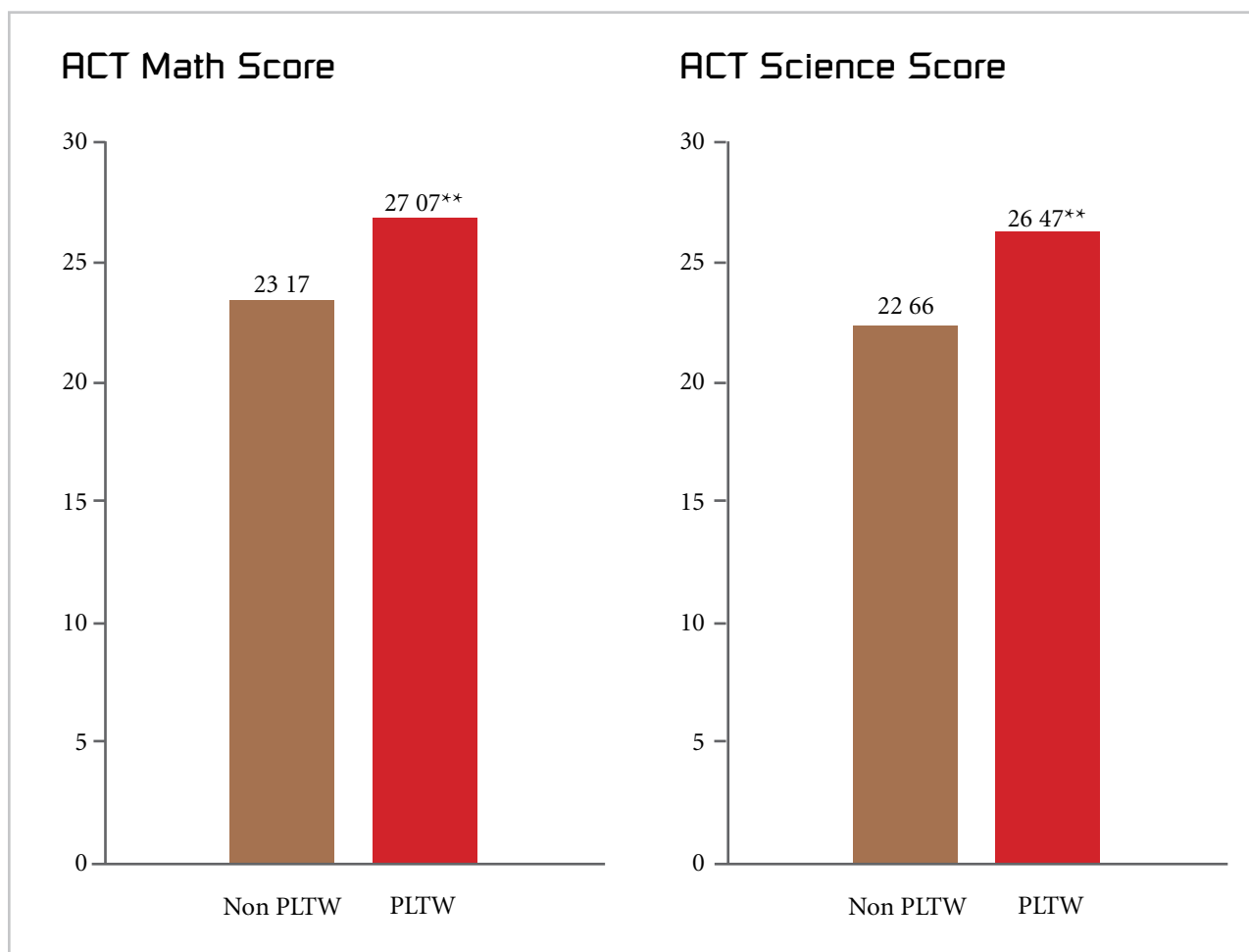
Examining the 2007 ACT scores for all Wisconsin high schools¹⁰:

- 67% of seniors completed the ACT
- The average composite score was 22.3

Next Steps:

A large rectangular area with a grey header containing the text "Next Steps:" and the rest of the area filled with horizontal dotted lines for writing.

Data Profile: Academic Outcomes



KEY FINDINGS:

Overall, students who completed PLTW courses had higher scores on the ACT math and science exams. Generally, PLTW seniors were scoring three to four points higher than seniors who had not completed courses as part of the Engineering academy. This difference is statistically significant ($p < .01$).

When controlling for other factors that influence ACT scores (such as gender, poverty, and prior academic achievement as measured by the 10th grade academic assessment scores), completing PLTW courses still has a significant positive effect on ACT math scores.

Several students noted that a lot of math is used in the PLTW courses. In describing a pitching machine being constructed for an engineering design and development project, one senior said: I had to calculate speeds, revolutions per minutes (rpms), and distances accurately so that everything would work.

Another senior observed: PLTW courses make a difference because it becomes a lot easier to see a purpose for learning all of the weird things that sometimes didn't make a whole lot of sense.

Research Evidence

The ACT College Readiness Benchmark for Math is 22 and for Science 24. Of those who meet the benchmarks, approximately 70% of those majoring in science fields completed degrees, compared to only 61% of those not achieving the Science benchmark ¹¹

For college students entering engineering and STEM majors at a research university, the major predictors of freshman success (GPA and retention to the sophomore year) were:

- High school GPA and class rank
- ACT math and science scores/ACT composite

Importance of decision to go to college:

- To get training for a specific career
- To be able to make more money

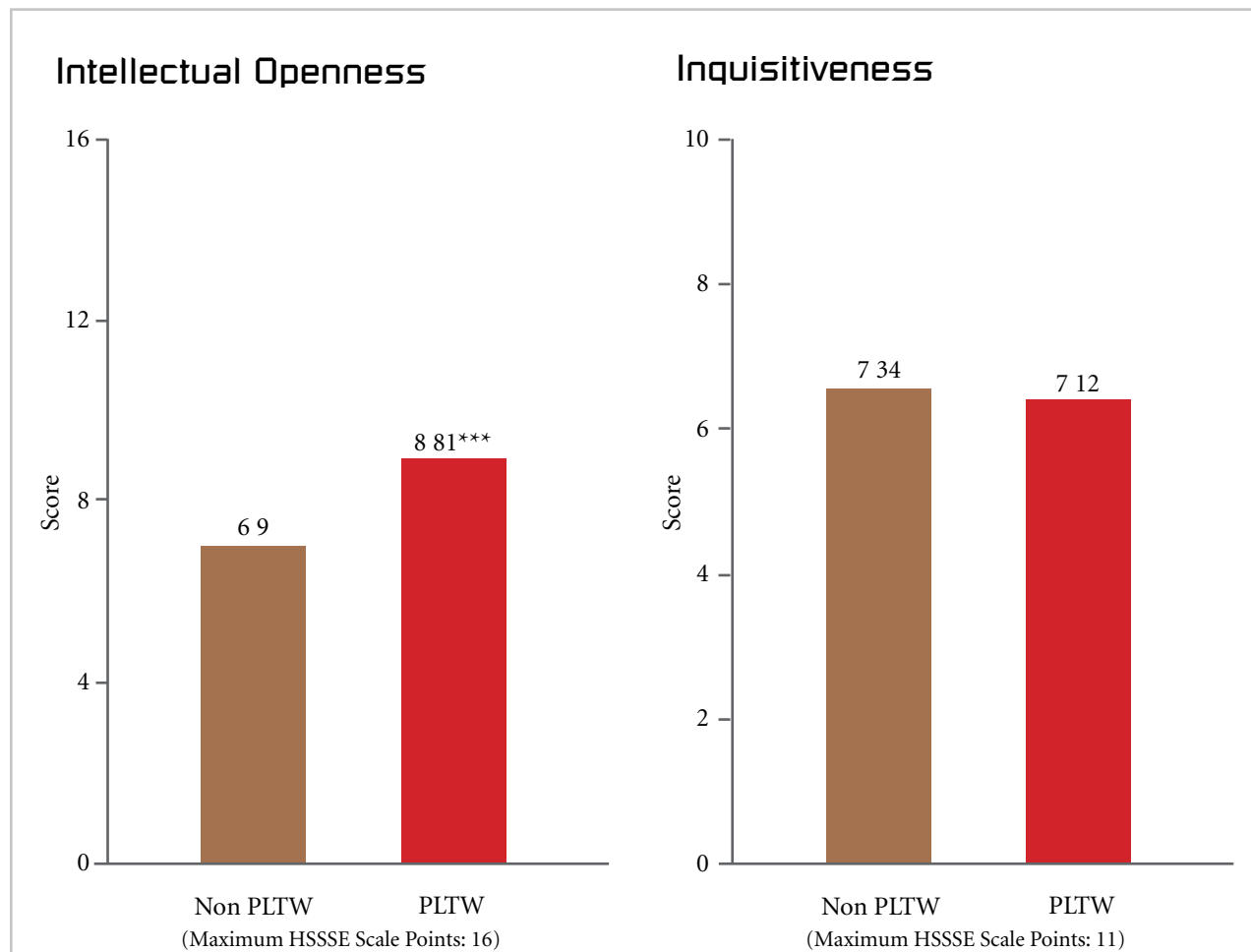
Source: <http://veenstraconsulting.com/docs/WOSM-Veenstra.pdf>

Next Steps:

A large rectangular area with a grey header containing the text "Next Steps:" and the rest of the area filled with horizontal dotted lines for writing.

- ▶ How important to you is reading for yourself (books, magazines, newspapers, online articles, etc.)? (5c)
- ▶ During this school year how often have you discussed questions in class that have no clear answers? (7n)
- ▶ I am motivated to work by a desire to learn? (8d)

Data Profile: College Readiness



KEY FINDINGS:

The PLTW Engineering seniors score about two points higher than other seniors, which is a statistically significant difference ($p < .01$). This suggests that participation in PLTW courses is associated developing students capacity to learn independently and discuss complex questions with others

On the limited number of available student engagement survey items (3), no significant differences were identified for PLTW Engineering seniors on the Inquisitiveness scale

- ▶ Discussed ideas from reading or classes with others outside of class (friends, family members, coworkers, etc.?) (7t)
- ▶ My school work makes me curious to learn other things? (8m)
- ▶ In general, I am excited about my classes? (8n)

Research Evidence

Several specific cognitive strategies are closely related to success in college settings (Costa & Kallick, 2000) ¹² They include the following key learner dispositions:

Intellectual openness: The student possesses curiosity and a thirst for deeper understanding, questions the views of others when those views are not logically supported, accepts constructive criticism, and changes personal views if warranted by the evidence. Such open mindedness helps students understand the ways in which knowledge is constructed, broadens personal perspectives and helps students deal with the novelty and ambiguity often encountered in the study of new subjects and new materials.

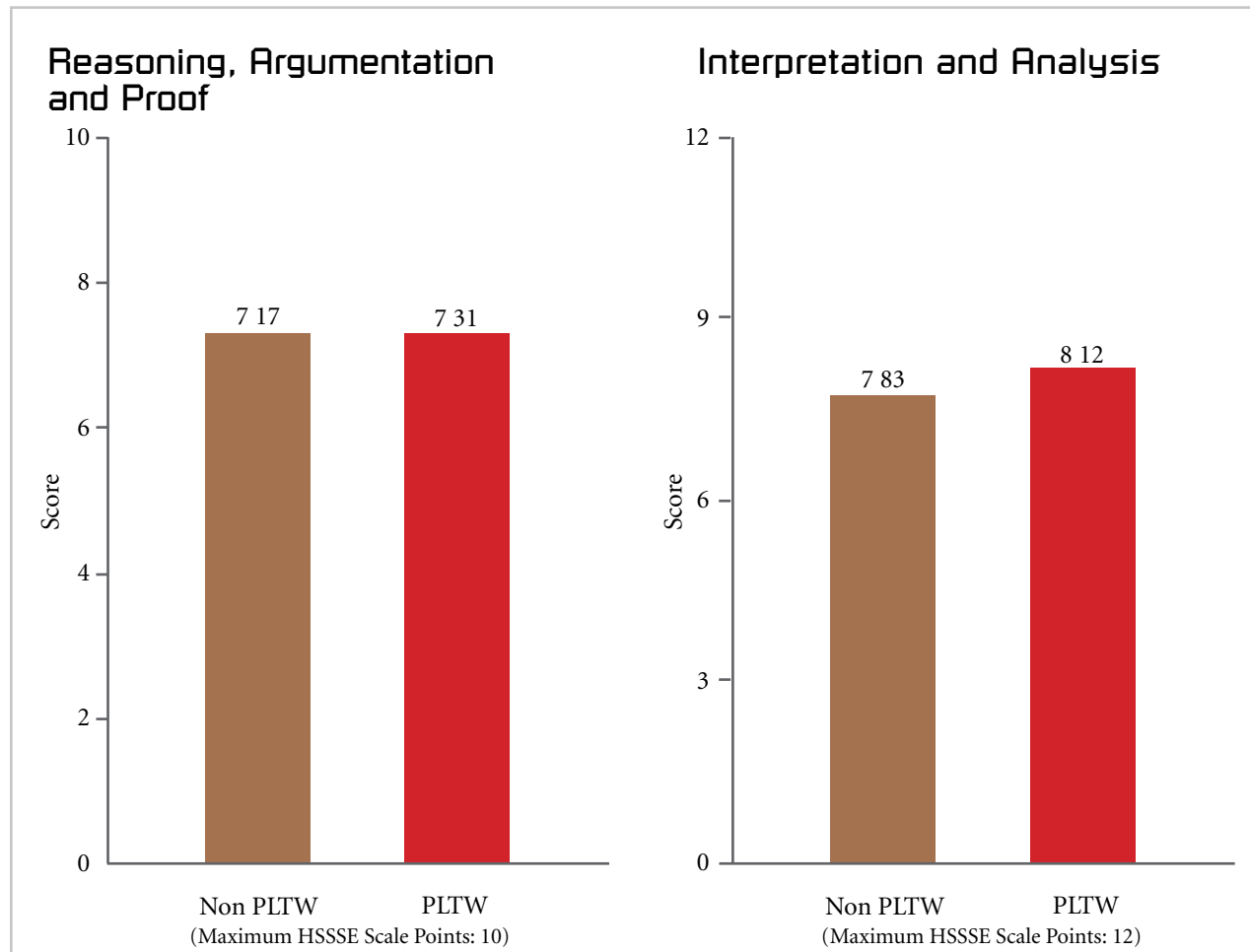
Inquisitiveness: The student engages in active inquiry and dialogue about subject matter and research questions and seeks evidence to defend arguments, explanations, or lines of reasoning. The student does not simply accept as given any assertion that is presented or conclusion that is reached, but asks why things are so.

Next Steps:

Lined writing area for notes.

- ▶ Discussed questions in class that have no clear answers? (7n)
- ▶ I enjoy the opportunity to be creative in school? (8k)
- ▶ How much has your experience at this school contributed to your growth in thinking critically? (16d)

Data Profile: College Readiness



KEY FINDINGS:

PLTW Engineering courses includes a number of project-based and problem-focused learning experiences that require students to develop and/or use complex analytical skills. However, for the TESLA seniors, there are no significant differences on the reasoning and interpretation/analysis scales developed from HSSSE items.

- ▶ Connected ideas or concepts from one class (or subject area) to another in doing assignments or participating in class discussions? (7q)
- ▶ I enjoy working on tasks that require a lot of thinking and mental effort? (8l)
- ▶ To what extent do you believe your high school emphasizes analyzing ideas in depth in work for classes? (15c)
- ▶ To what extent do research projects excite and/or engage you? (26e)

Research Evidence

Several specific key cognitive strategies are closely related to success in college settings (Costa & Kallick, 2000)¹² They include the following key dispositions on the part of learners:

Reasoning, Argumentation and Proo—The student constructs well-reasoned arguments or proofs to explain phenomena or issues; utilizes recognized forms of reasoning to construct an argument and defend a point of view or conclusion; accepts critiques of or challenges to assertions; and addresses critiques and challenges by providing a logical explanation or refutation, or by acknowledging the accuracy of the critique or challenge

Analysis—The student identifies and evaluates data, material, and sources for quality of content, validity, credibility, and relevance The student compares and contrasts sources and findings and generates summaries and explanations of source materials

Interpretation—The student analyzes competing and conflicting descriptions of an event or issue to determine the strengths and flaws in each description and any commonalities among or distinctions between them; synthesizes the results of an analysis of competing or conflicting descriptions of an event or issue or phenomenon into a coherent explanation; states the interpretation that is most likely correct or is most reasonable, based on the available evidence; and presents orally or in writing an extended description, summary, and evaluation of varied perspectives and conflicting points of view on a topic or issue

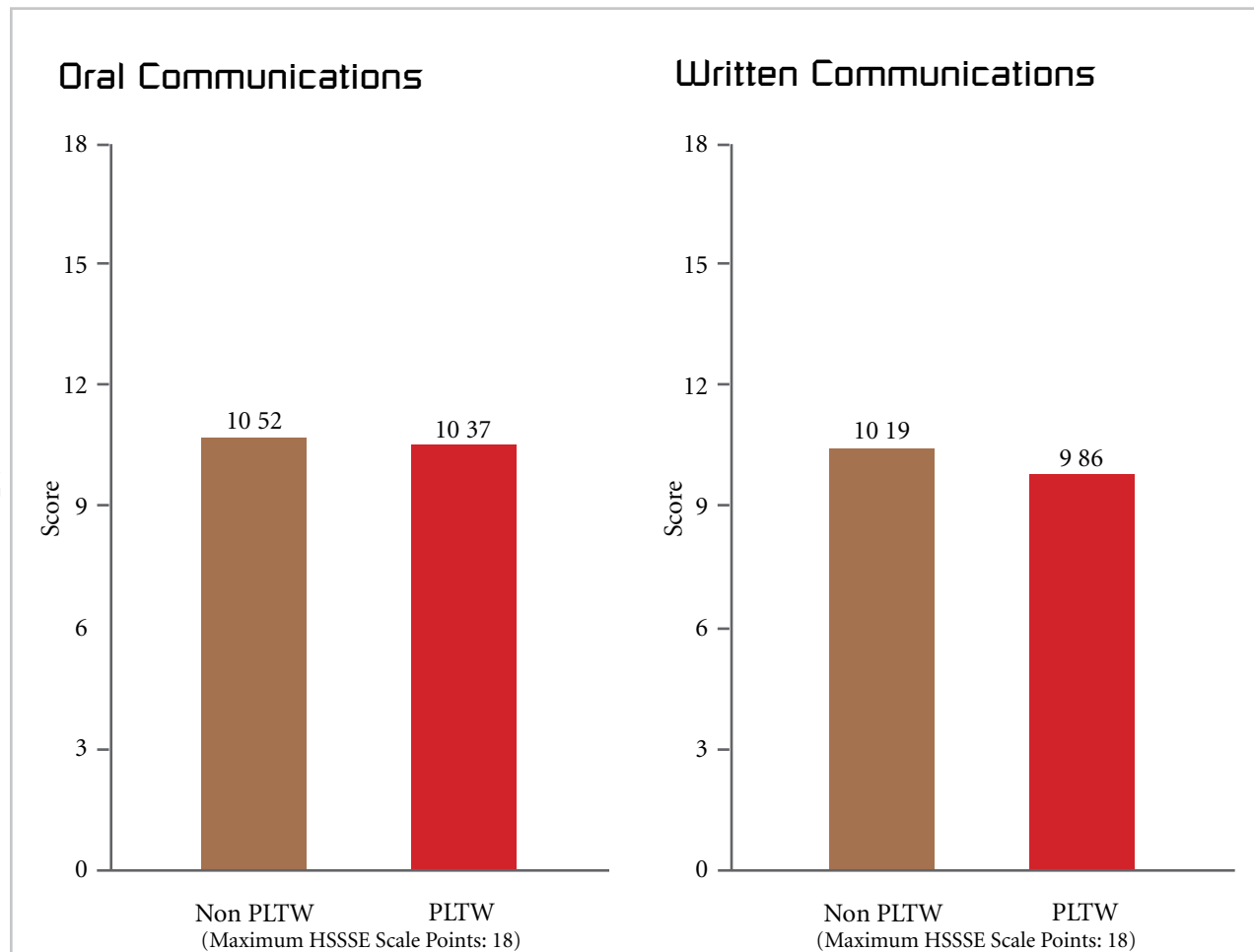
Next Steps:

A large rectangular area with a grey header containing the text "Next Steps:". Below the header are approximately 18 horizontal dotted lines for writing.

- ▶ During this school year how often have you made a class presentation? (7d)
- ▶ Discussed ideas from readings or classes with teachers outside of class? (7s)
- ▶ Discussed ideas from reading or classes with others outside of class (friends, family members, coworkers, etc.?) (7t)
- ▶ Had conversations or worked on a project with at least one student of a race or ethnicity different from your own? (7u)
- ▶ Talked to an adult about career goals? (7w)
- ▶ How much has your experience at this school contributed to your growth in speaking effectively? (16c)

Data Profile: College Readiness

▼
25
▲

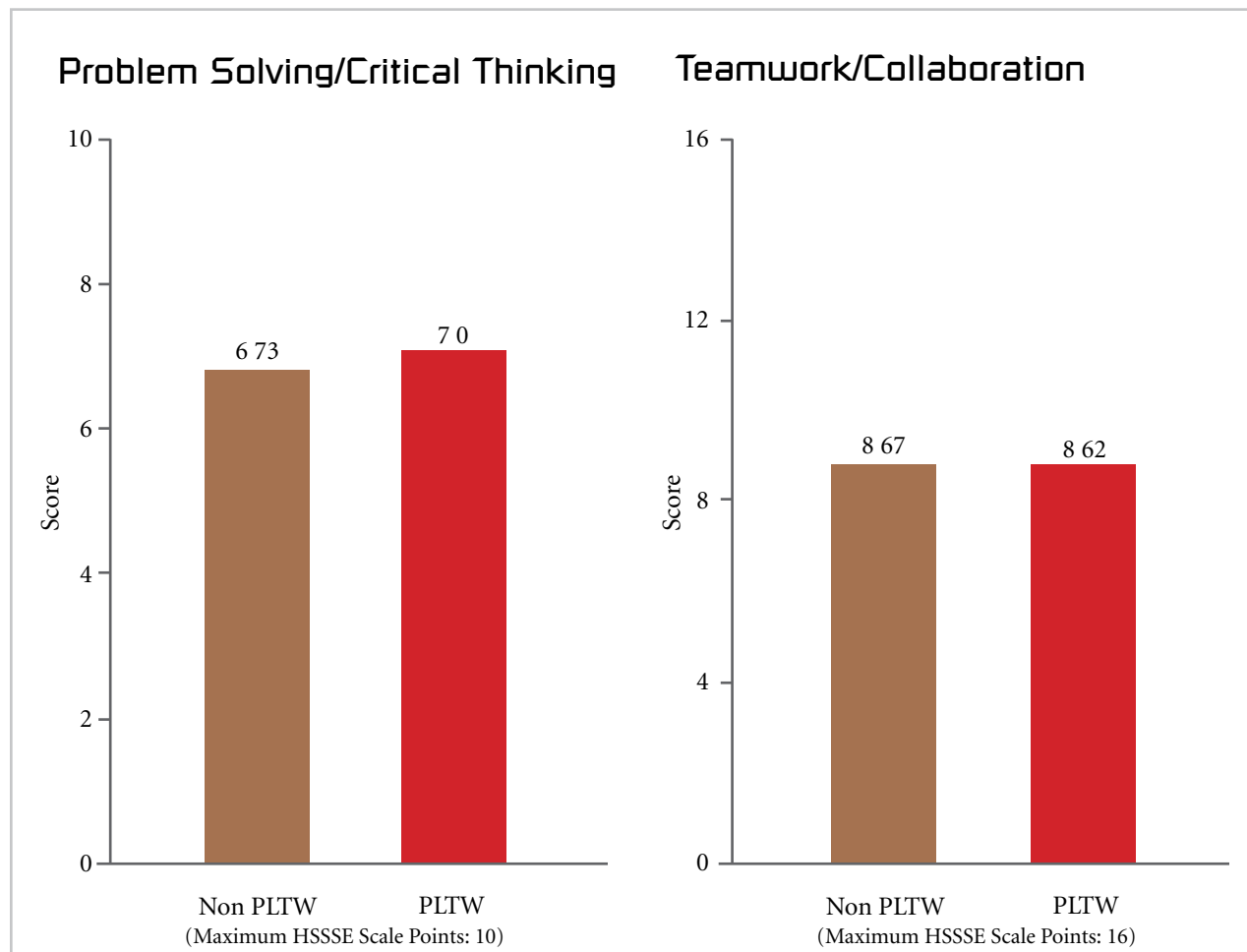


KEY FINDINGS:

PLTW Engineering courses includes a number of opportunities for students to strengthen their oral and written communication skills. However, for the TESLA seniors, there are no significant differences on the written and oral communication scales developed from HSSSE items.

- ▶ I like discussions in which there are no clear answers? (8j)
- ▶ How much has your experience at this school contributed to your growth in thinking critically? (16d)
- ▶ How much has your experience at this school contributed to your growth in solving real-world problems? (16i)

Data Profile: College Readiness

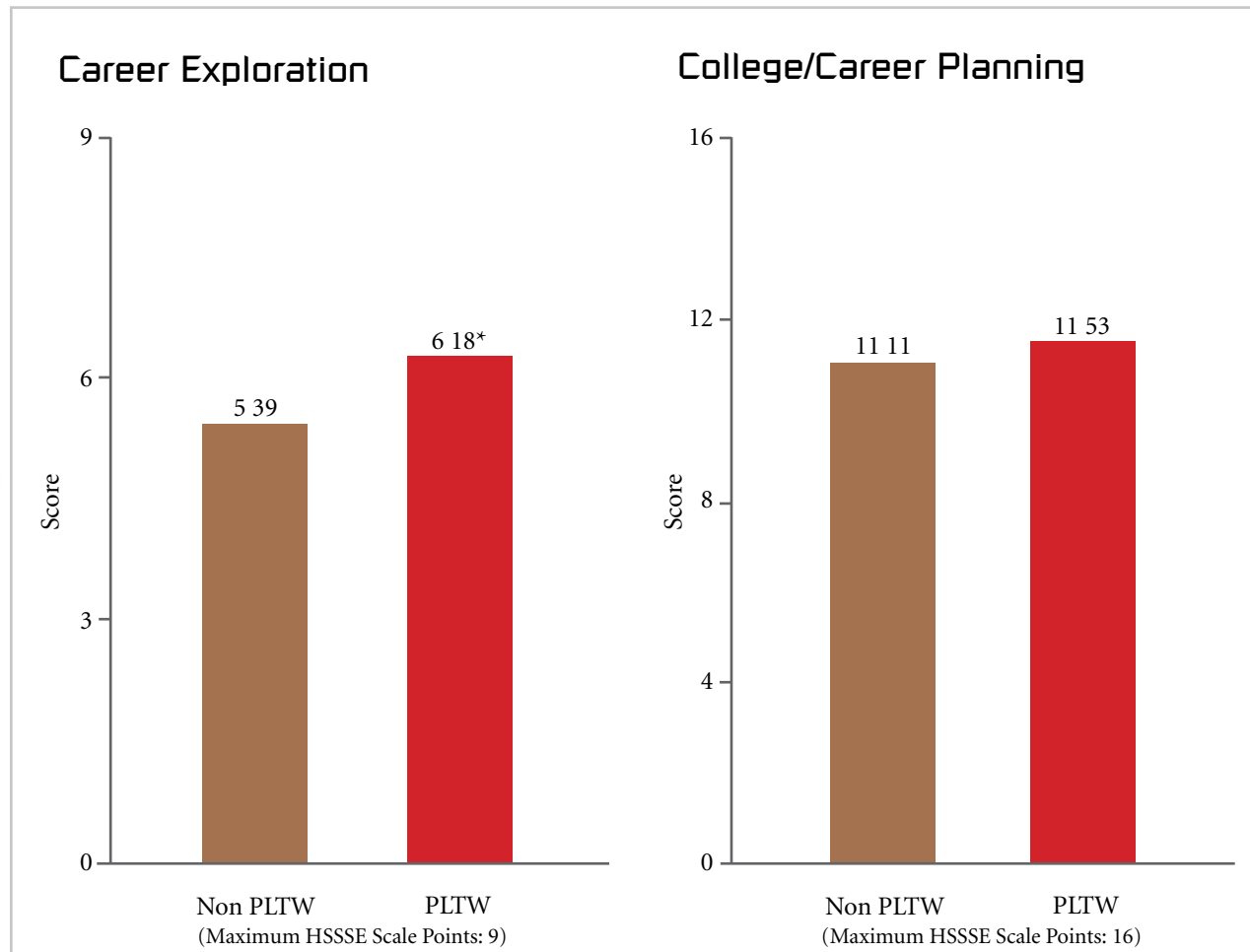


KEY FINDINGS:

Several of the PLTW courses in provide students with opportunities to work in teams with other students to address challenging, real-world engineering problems. In addition, TESLA participates annually in the First Robotics competition, which requires student teams to design, build, and demonstrate a robot to perform complex functions. However, for the 2008 TESLA seniors, there are no significant differences on the scales developed from the HSSSE items to assess problem solving, critical thinking, and teamwork activities being offered in the high school.

- ▶ Talked to an adult in the school about career goals? (7w)
- ▶ How much has your experience at this school contributed to your growth in solving real world problems? (16i)
- ▶ How much has your experience at this school contributed to your growth in developing clear career goals? (16k)

Data Profile: Career Readiness



KEY FINDINGS:

TESLA/PLTW seniors were significantly more likely ($p < .05$) to report participating in career exploration activities than non-PLTW seniors

In terms of college and career planning experiences and insights, the TESLA/PLTW seniors and non-PLTW seniors reported similar responses

- ▶ Talked to an adult about career goals? (7x)
- ▶ I see how the work I am doing now will help me after high school? (8p)
- ▶ To what extent does your high school emphasize continuing schooling after high school? (15i)
- ▶ How much has your experience at this school contributed to your growth in acquiring skills related to work after high school? (16a)
- ▶ How much has your experience at this school contributed to your growth understanding the relevance of school work to life after high school? (16i)

I joined TESLA because I wanted to be an engineer. The first couple of courses helped me figure out exactly what kind of engineer (senior, female).

This (TESLA) has helped us a lot because a lot of us want to go into engineering. This (experience) at least points us in the right direction, which is better than going into college not knowing (what field of study to pursue).

Research Evidence

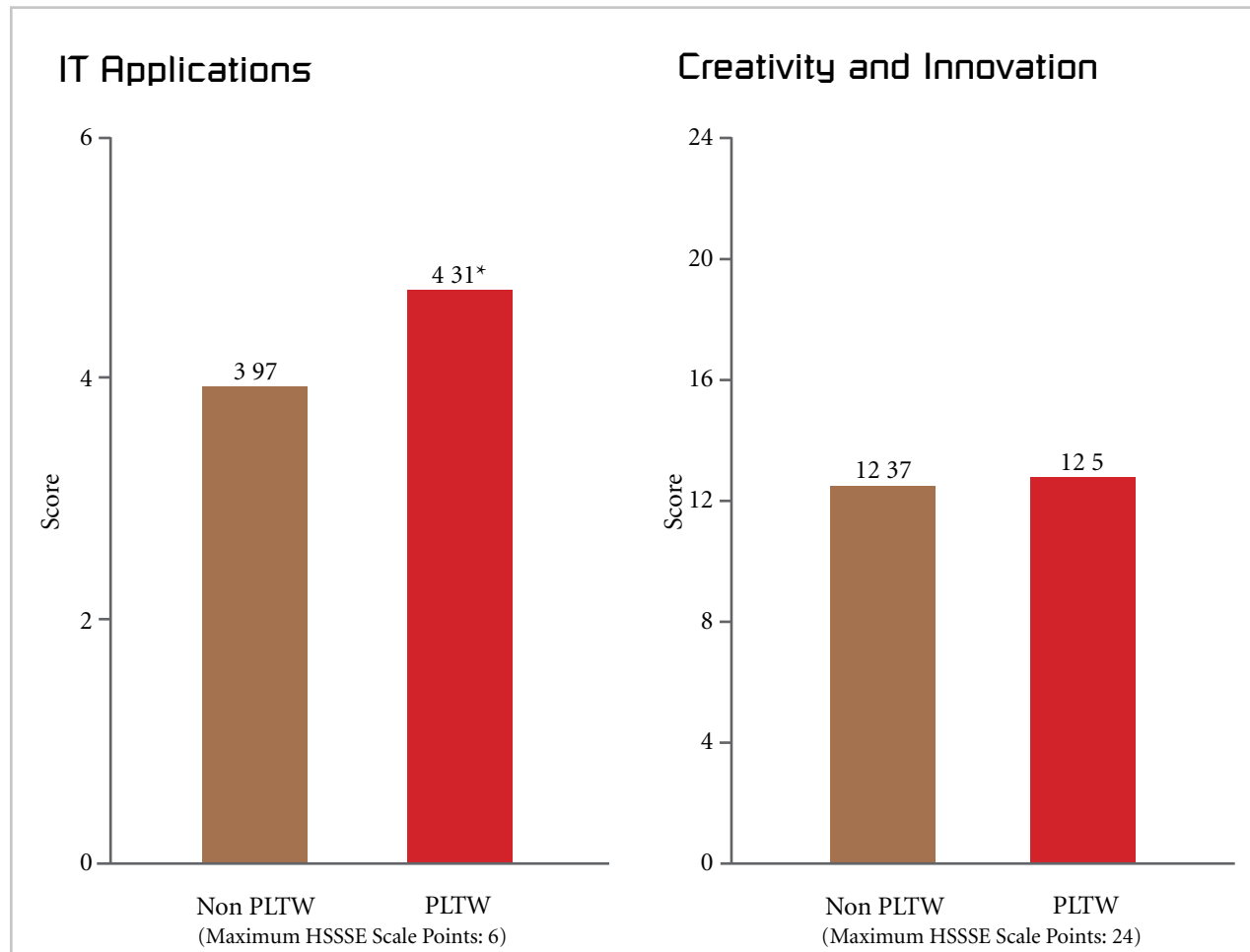
Increasing the amount of time that students spend talking with counselors and teachers about students' plans is associated with increased achievement in mathematics, science, and reading (Kaufman, Bradby, and Teitelbaum, 2000)¹⁵

Next Steps:

Dotted lines for writing next steps.

- ▶ To what extent do you believe your high school emphasizes using computers for class work? (15g)
- ▶ How much has your experience at this school contributed to your growth in using computers and the internet? (16f)

Data Profile: Career Readiness



KEY FINDINGS:

TESLA/PLTW seniors are slightly more likely to be using IT applications than non-PLTW seniors, but the difference is not statistically significant

On the creativity and innovation scale, the TESLA/PLTW seniors' experiences and responses were quite similar to the non-PLTW seniors

- ▶ How important to you are school sponsored activities? (5d)
- ▶ Connected ideas or concepts from one class (or subject area) to another in doing assignments or participating in class discussions? (7q)
- ▶ I enjoy the opportunity to be creative at school? (8k)
- ▶ I take pride in the quality of my school work? (8h)
- ▶ To what degree do presentations in class excite and/or engage you? (26g)

All of our previous classes have been leading up to the Engineering Design and Development project we are doing this year. Without the other classes we wouldn't know how to do any of this. We are incorporating all the other classes and putting together a major project.

This is not a computer class where you're constantly doing stuff on the computer. In this class you are doing the design and actually following through and building it, which really helps.

Research Evidence

In the Conference Board's (2006) recent survey of 400 leading U.S. employers, Human Resource professionals indicated that Creativity/Innovation is projected to "increase in importance" for future workforce entrants. More than 70 percent (73.6 percent) of employer respondents indicated that creative instincts and insights are a vital skill in today's workplace. However, more than half of employer respondents (54.2 percent) report new workforce entrants with a high school diploma are "deficient" in this skill set, and relatively few consider two-year and four-year college-educated graduates are considered "excellent" in creative endeavors (4.1 percent and 21.5 percent, respectively).

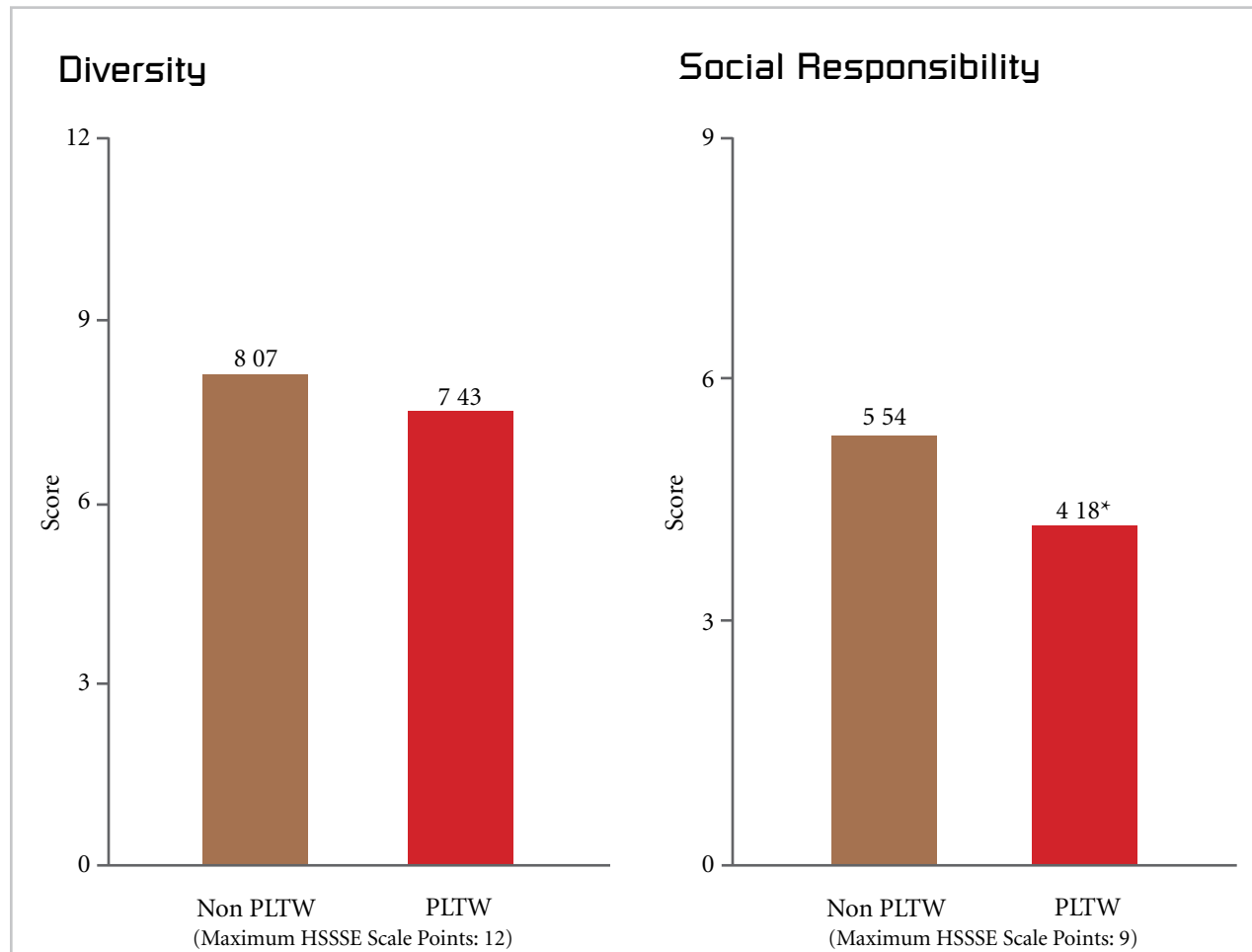
Next Steps:

Lined writing area for notes.

- ▶ Had conversations or worked on a project with at least one student of a race or ethnicity different from your own? (7u)
- ▶ Had conversations or worked on a project with at least one student who differs from you in terms of religious beliefs, political opinions, income backgrounds, or personal values? (7v)

- ▶ How much has your experience at this school contributed to your growth in understanding people of other racial and ethnic backgrounds? (16m)
- ▶ How much has your experience at this school contributed to your growth in treating people with respect? (16o)

Data Profile: Career Readiness



KEY FINDINGS:

Given the relative homogenous composition of the Appleton East High School population and the surrounding community, the opportunities to engage in building culturally diverse perspectives through school and out-of-school learning experiences is limited. There are no measureable differences between the PLTW and non-PLTW seniors on the diversity scale.

While significant differences were found on the social responsibility scale, they could be attributed to a number of factors, including the amount of time a student has to participate in out of school activities.

- ▶ How important to you is doing volunteer work? (5g-ii)
- ▶ How much has your experience at this school contributed to your growth in gaining awareness of conditions in the community outside of school? (16j)
- ▶ Have you participated in community service or volunteer work while in high school? (17a)

Research Evidence

In the Conference Board's (2006)⁷ recently survey of 400 leading U S employers young adults entering the workforce from high school or college need wider and more diverse perspectives While more than half of the employers (52 1%) say diversity is very important, 62% describe the typical high school graduates' preparation only as "adequate"

Of the 15 3 million students enrolled in 2- and 4-year degree-granting institutions at the end of the 20th century, only about 3% (500,000) were students with disabilities (Gerald & Hussar, 2002)

According to the National Science Foundation⁴, scientists and engineers with disabilities were 7% of all scientists and engineers See: <http://www.nsf.gov/statistics/wmpd/figh-8.htm>

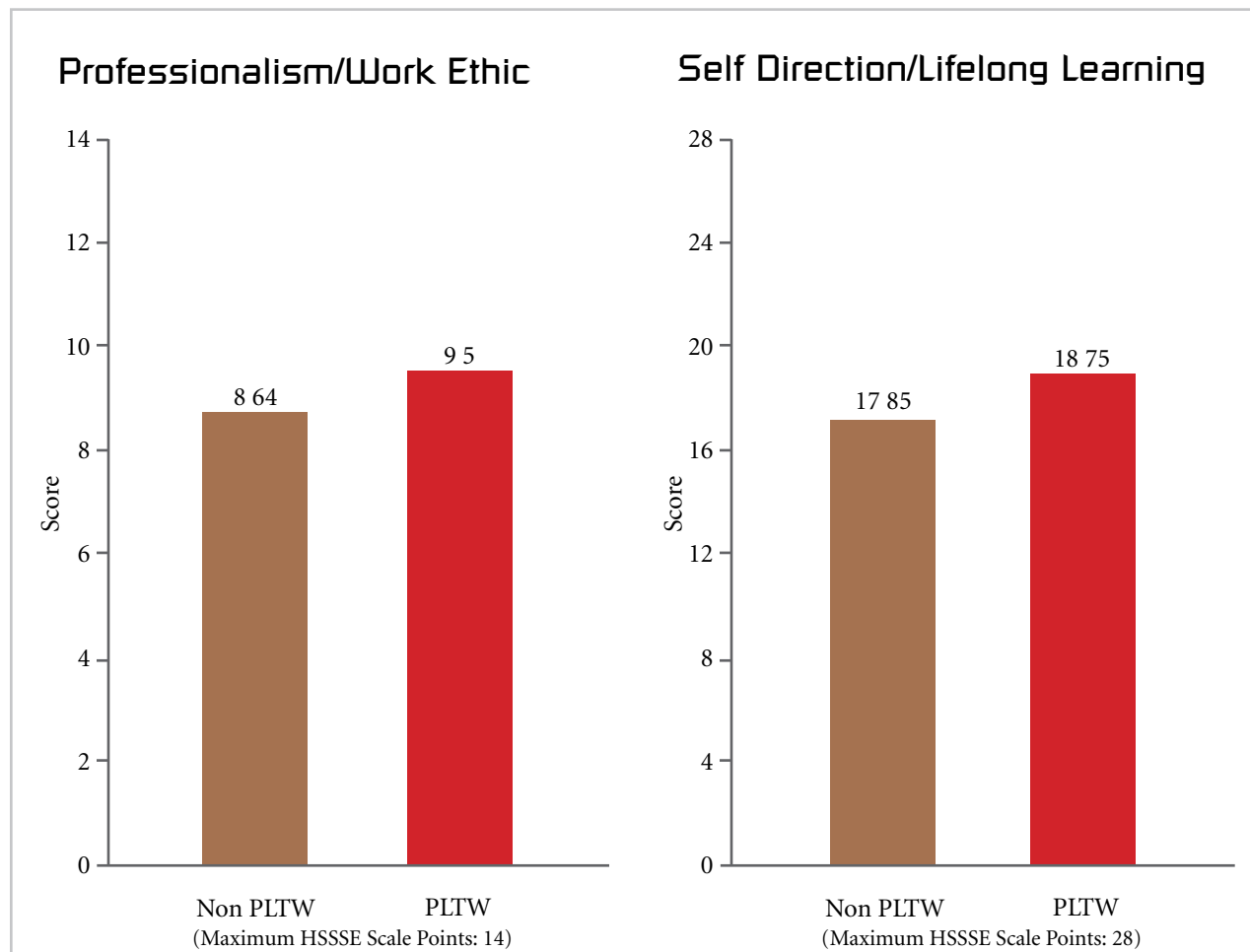
Next Steps:

A large rectangular area with a grey header containing the text "Next Steps:" and the rest of the area filled with horizontal dotted lines for writing.

- ▶ How important to you is working for pay? (5f)
- ▶ Attended class with all assignments completed? (7i)
- ▶ Have you participated in a work-study program? (17b)

Data Profile: Career Readiness

▼
35
▲



KEY FINDINGS:

On the indicators of professionalism and work ethnics, the TESLA/PLTW seniors scored nearly 1-point higher than their peers, but the difference is not statistically significant

TESLA/PLTW seniors are also inclined to be somewhat more engaged in self-direction behaviors and lifelong learning activities than their non-PLTW colleagues. The difference, however, is not statistically significant

- ▶ How important to you working for pay? (5f)
- ▶ I am motivated to work by a desire to learn? (8d)
- ▶ My school work makes me curious to learn other things? (8m)
- ▶ How much has your school contributed to your growth in working well with others? (16g)
- ▶ How much has your school contributed to your growth in understanding yourself? (16n)
- ▶ How much as your school contributed to your growth in developing personal beliefs and values? (16p)
- ▶ Have you taken one or more Advance Placement courses, or courses at a college/university? (17c)

Research Evidence

The Conference Board (2006)⁷ recently surveyed over 400 employers across the United States. Employers were asked to describe the skill sets that new entrants—recently hired graduates from high school, two-year colleges or technical schools, and four-year colleges—need to succeed in the workplace. Among the most important skills cited by employers:

- Professionalism/Work Ethic
- Oral and Written Communications
- Teamwork/Collaboration and
- Critical Thinking/Problem Solving

“A “very important” skill for all new entrants into the workforce is Professionalism/Work Ethic, which is rated highly by employer respondents across all three educational levels—80.3 percent say Professionalism/Work Ethic is “very important” for high school graduates, 83.4 percent for two-year college graduates, and 93.8 percent for four-year college graduates. Employer respondents were almost unanimous in their emphasis on Professionalism/Work Ethic, regardless of industry, size of firm, or region.”

According to the National Survey of Student Engagement (2006) the vast majority of first-year college students are expected to make presentations and to explain what they have learned. In these courses, students are expected to be independent, self-reliant learners who recognize when they are having problems and know when and how to seek help from professors, students, or other sources (Conley, 2007).

This year we are designing, building, and evaluating our senior projects, and time management has been a big, key factor for us.

The projects are a lot more serious for us this year compared to the last three years, since we go through everything in so much more detail, compared to the small take-home projects.

The teacher-student interaction is much better in these PLTW classes. You know all of your teachers and they care about you. You have more of a relationship with them (than other teachers).

Next Steps:

.....

.....

.....

.....

.....

.....

.....

.....

End Notes

¹ 2006-2016 Wisconsin Projections, Office of Economic Advisors, Wisconsin Department of Workforce Development

² Details on the Project Lead the Way (PLTW) Engineering Program are available at: <http://www.pltw.org/>

³ U S Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), “High School Transcript Study”, Table 4, p 22

⁴ National Science Foundation, Women, Minorities and Persons with Disabilities in Science and Engineering Retrieved February 10, 2009 at http://www.nsf.gov/statistics/wmpd/sex_cfm#degrees

⁵ U S Department of Education, Doing What Works Clearinghouse

⁶ Adelman, C (2006) The toolbox revisited: Paths to degree completion from high school through college Washington, D C : U S Department of Education Retrieved February 15, 2009 from <http://www.ed.gov/rschstat/research/pubs/toolboxrevisit/index.html>

⁷ Conference Board (2006) Are they really ready to work? Employers’ perspectives on the basic knowledge and applied skills of new entrants to the 21st century U S workforce Retrieved January 9, 2009 from http://www.21stcenturyskills.org/documents/FINAL_REPORT_PDF09-29-06.pdf

⁸ Plank, S (2001) A question of balance: CTE, academic courses, high school persistence, and student achievement Journal of Vocational Education Research, 26(3), 279-327

⁹ Leuwerke, W C , Robbins, S , Sawyer, R & Howland, M (2004) Predicting engineering major status from mathematics achievement and interest congruence Journal of Career Assessment, 12(2), 135-149

¹⁰ Department of Public Instruction, State of Wisconsin (2007, August 15) News Release

¹¹ ACT High School Profile, Graduating Class of 2008 Retrieved January 10, 2009 from <http://www.act.org/news/data/08/benchmarks.html>

¹² Costa, A L E , & Kallick, B E (2000) Discovering and exploring key cognitive strategies: A developmental series, book 1 (No ED439101) Alexandria VA: Association for Supervision and Curriculum Development

¹³ Marra, R M , et al , Women Engineering Students and Self-Efficacy: A Multi-Year, Multi-Institution Study of Women Engineering Student Self-Efficacy Journal of Engineering Education (Washington, D C) v 98 no 1 (January 2009) p 27-38

¹⁴ Conley, D (2007) Toward a more comprehensive conception of college readiness Eugene, OR: Educational Policy Improvement Center

¹⁵Kaufman, P, Bradby, D , & Teitelbaum, P (2000) High schools that work and whole school reform: Raising academic achievement of vocational completers through the reform of school practice Berkeley, CA: University of California at Berkeley, National Center for Research in Vocational Education