# Current Status and Practice of *Project Lead the Way* in Iowa: A Longitudinal Approach

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# Background

- International universities have increased their competitiveness in science, technology, engineering, and mathematics (STEM) related degree programs
- Female and racial/ethnic minority groups are under-represented in STEM related fields.
- State of Iowa implemented PLTW program
  - PLTW has developed a pre-engineering curriculum in 50 states for secondary students that emphasize hands-on experiences in engineering, design, and technology in the past decade.
  - For more information: www.pltw.org

# Background

- Rapid growth of PLTW program in middle schools and high schools in Iowa.
  - Iowa PLTW enrollment in 2008 was 1737, a 66% increase since 2007
- Lack of research regarding PLTW's efficacy.
  - Lack comprehensive K-16 data
  - Relied on self-reported data
  - Fail to control for pre-existing differences in student demographic characteristics, PLTW course enrollment, academic performance, and standardized tests

# Purpose

- This study proposes a statewide, longitudinal evaluation, using a K-16 assessment model in Iowa's middle schools, high schools, community colleges, and Regent universities.

# Research Questions

- RQ1:
  - What are the demographic characteristics – socio-demographic, academic, and cognitive – of PLTW students and what characteristics predict early entry into the program?
- RQ 2:
  - Do PLTW students take more math and science courses than non-PLTW students?
- RQ3:
  - Is the cognitive improvement for PLTW students greater than non-PLTW students?

# Methodology

- This evaluation utilized secondary and postsecondary data maintained by the State of Iowa and the National Student Clearinghouse.


Figure 1. Progress of PLTW students from 8th grade to college

*Project EASIER: Electronic Access System for Iowa Education Records
*Community College MIS: Management Information Records

# Findings

- In 2008, 1,737 students were enrolled, which was an increase of 66% since last year.

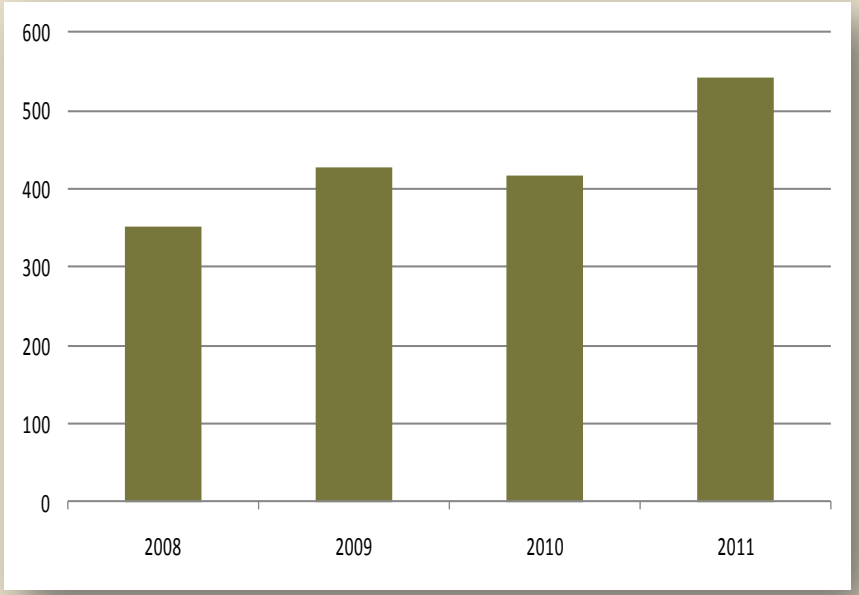



Figure 2. Enrollment in PLTW by Cohort (Graduating Class)

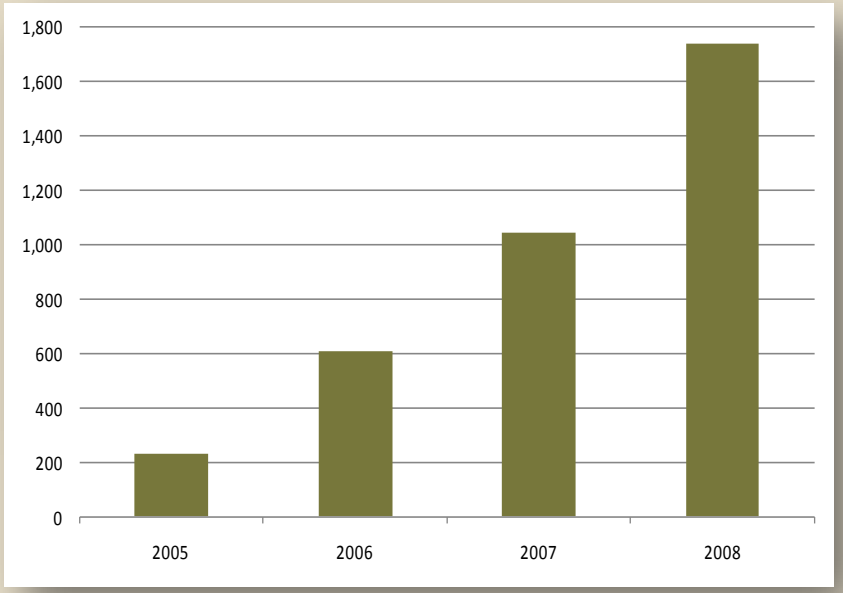
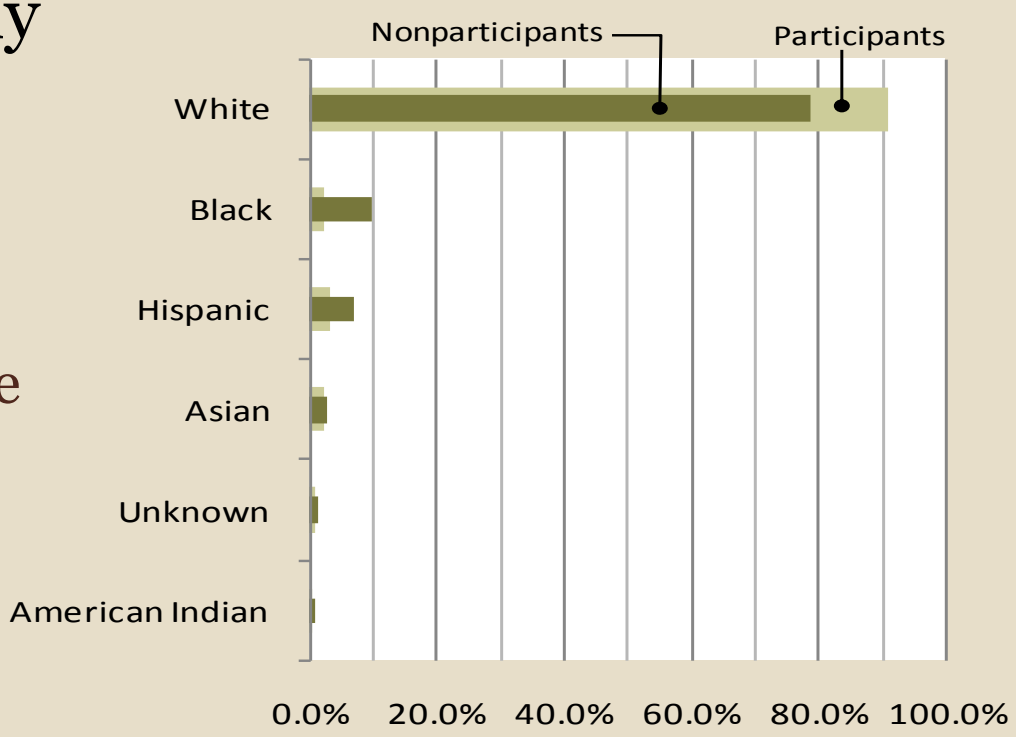



Figure 3. Enrollment in PLTW: 2005 - 2008

# Ethnicity

- PLTW participants were disproportionally white compared to nonparticipants.
  - 90% of participants were white, compared to 79% of the nonparticipants.

Figure 4. Percentage of Enrollment by Race/Ethnicity and Project Lead The Way Participation



# Gender

- PLTW participants were dominantly male. In contrast, the nonparticipants were evenly divided between males and females.
  - Overall, 16 percent of participants were female, compared to 51 percent of nonparticipants.
  - Female participants were greater in PLTW for the younger cohorts.

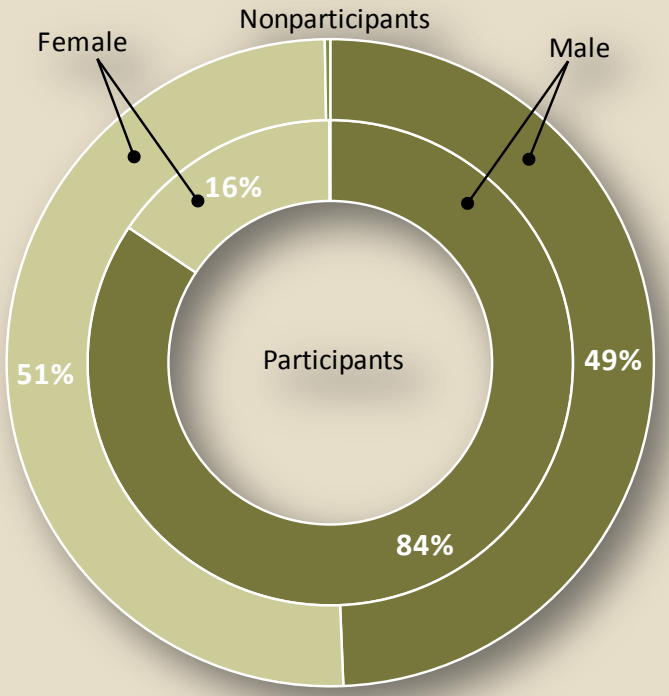



Figure 5. Percentage of Enrollment by Gender and PLTW Participation

# Free or Reduced Lunch Program Participation

- PLTW participants were less likely to be eligible for free or reduced lunch than their peers.
  - 22% of participants were eligible for free or reduced lunch;
  - 41.4% of nonparticipants were eligible for the same program.


Figure 6. Percentage of Non-PLTW and PLTW Students who were qualified for Free or Reduced Lunch in Cohort 2008, 2009, 2010, and 2011.

- *Free or reduced lunch: An indicator of low-income students. Married couples with two children are eligible for free meals if they earn less than $18,200 a year and eligible for reduced price meals if they earn less than $25,900 (Iowa Department of Education, 2009).*

# Joint Enrollment

- PLTW participants were more likely to jointly enroll at a community college.
  - 17% of participants were jointly enrolled, compared to 12% of non participants.

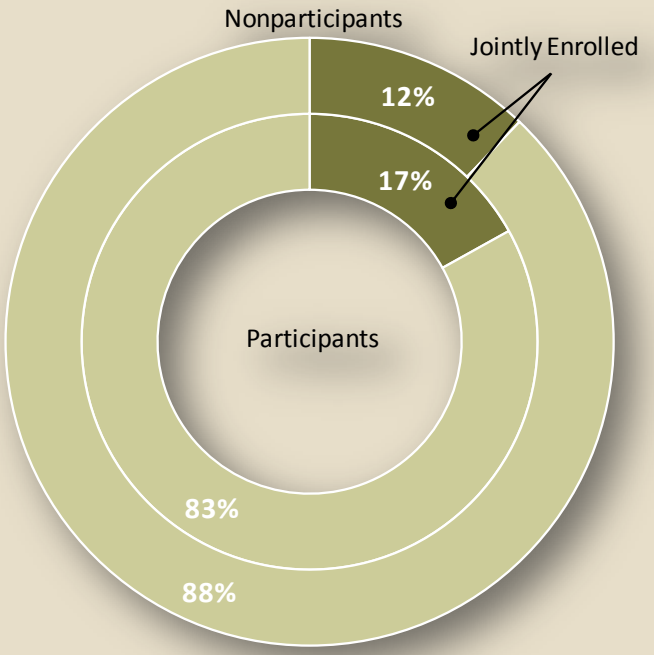
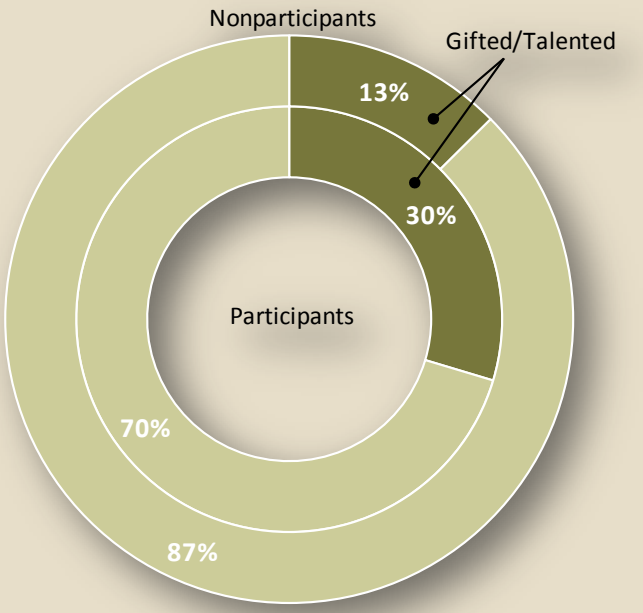



Figure 7. Percentage of Joint Enrollment in Community Colleges by Project Lead The Way Participation

# Gifted & Talented Programs Participation

- PLTW participants were more likely to be enrolled in gifted and talented programs.
  - 30% of participants met the requirements in 2008, compared to 13% of nonparticipants.




- *Gifted and talented students have either demonstrated achievement or potential ability or require educational services to meet their abilities that are beyond the regular school program.*

Figure 8. Percentage of Enrollment in Gifted and Talented by Project Lead The Way Participation

# ITBS Performance

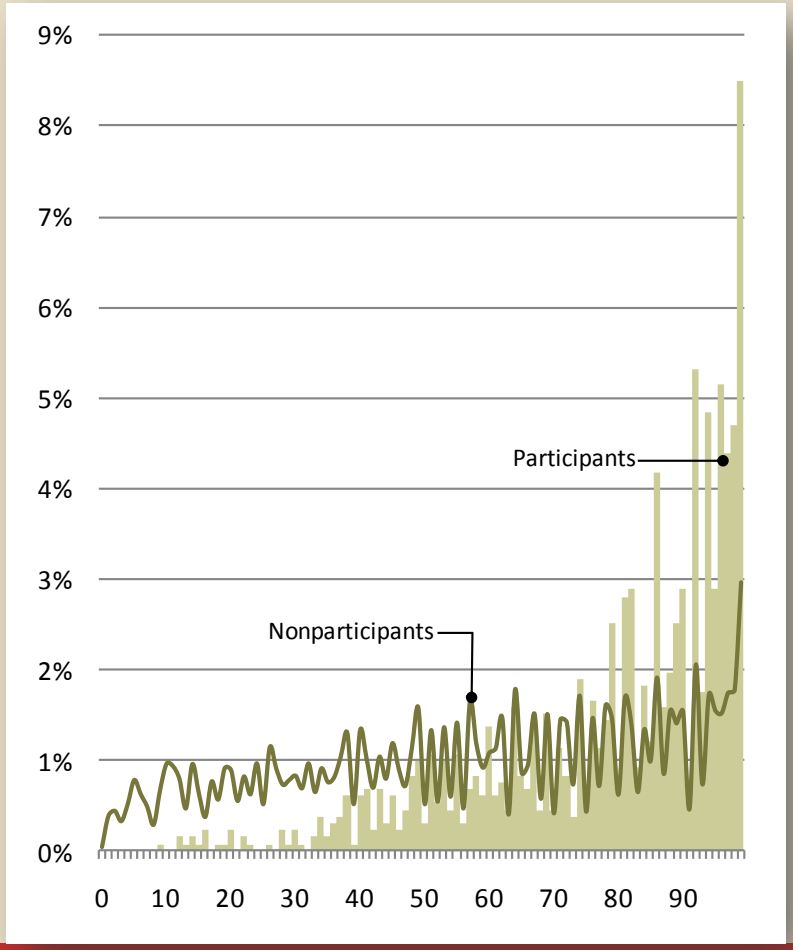
- PLTW participants performed better in math and science before high school and in their junior year.
  - 61% of participants were above 80th percentile in math, compared to 28% of nonparticipants
  - 55% of participants were above 80th percentile in science, compared to 28% of nonparticipants

ITBS: The Iowa Tests of Basic Skills

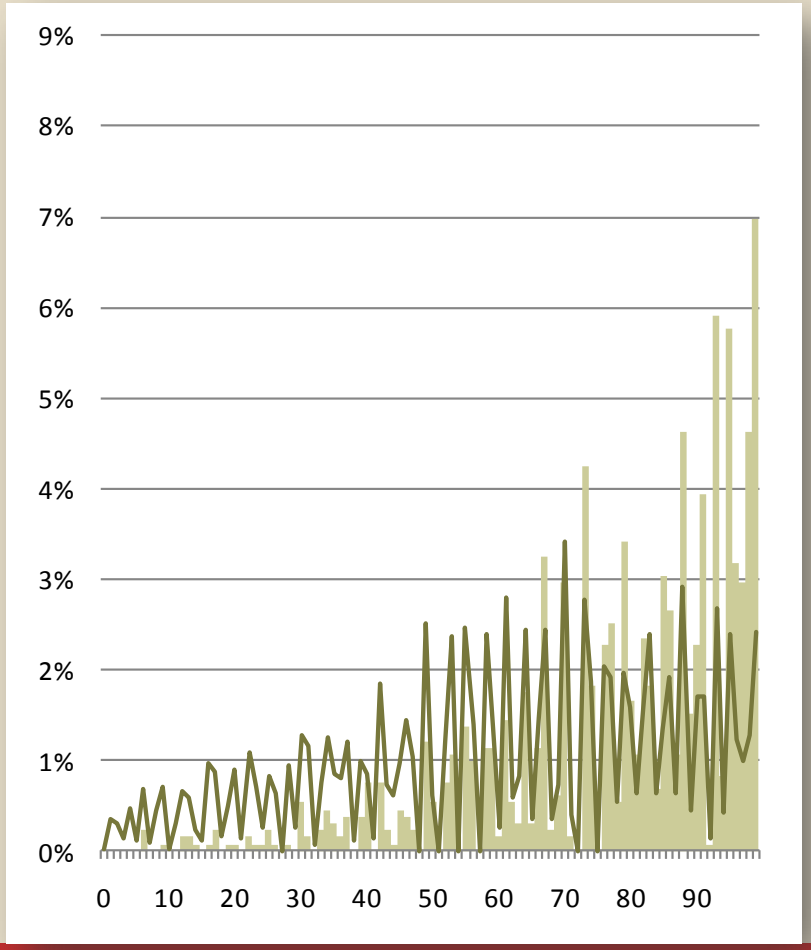
# ITBS-Math & Science

Figure 9. Results from 8th Grade ITBS in Math and Science

a. 8th Grade ITBS—Math




b. 8th Grade ITBS—Science



# ITEDs Performance

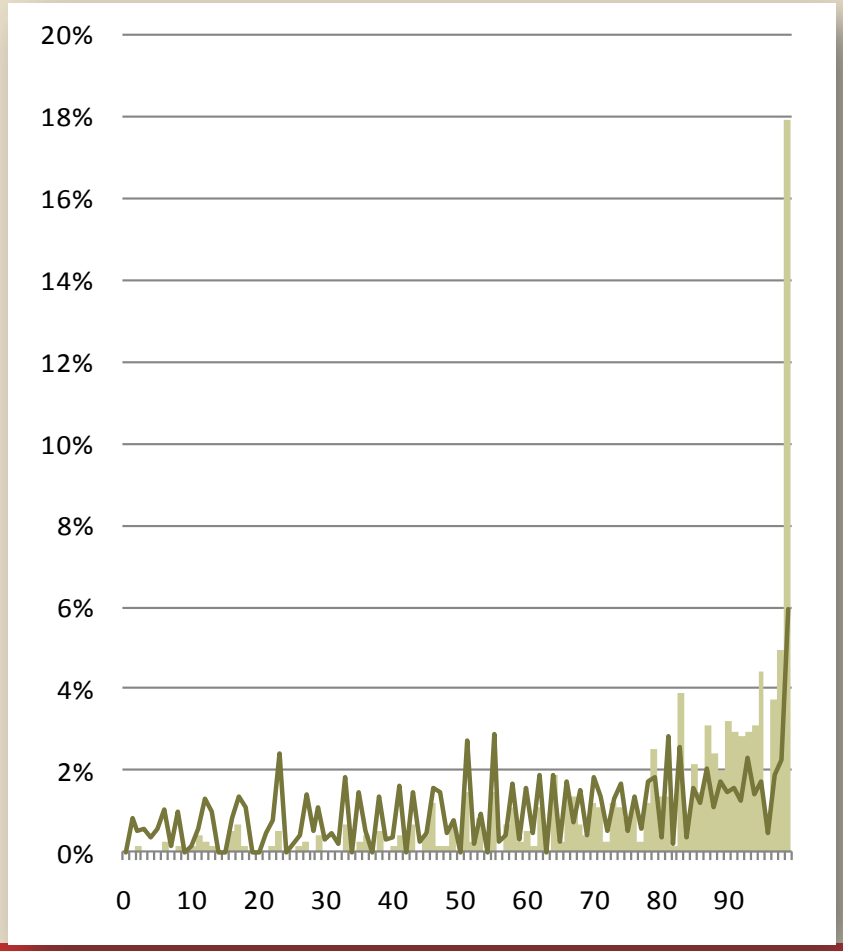
- PLTW participants performed comparatively better on the junior year ITEDs.
  - 64% of participants were over the 80th percentile in math, compared to 34% of nonparticipants
  - 61% of participants were over the 80th percentile in science, compared to 36% of nonparticipants

ITEDs: Iowa Tests of Educational Development

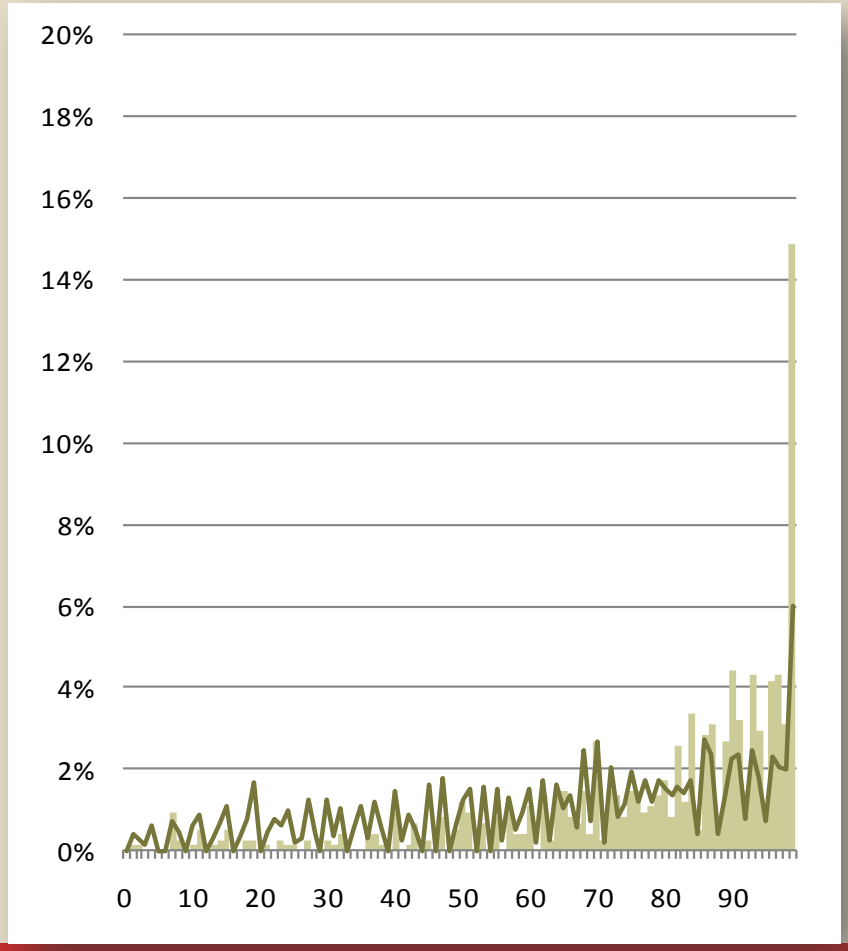
# ITEDs-Math & Science

Figure 10. Results from 11th Grade ITED in Math and Science

a. 11th Grade ITED—Math




b. 11th Grade ITED—Science

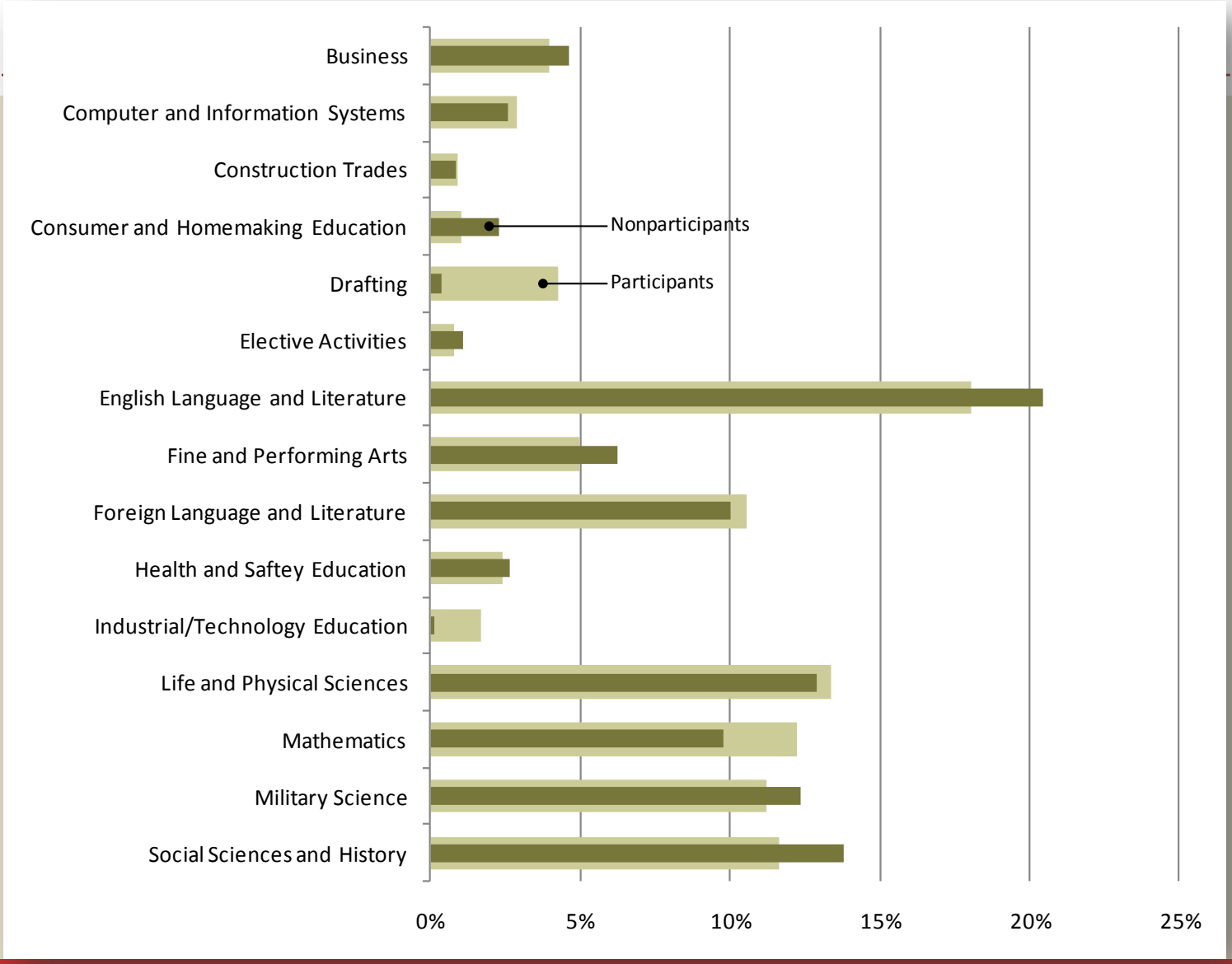


# Course Taking

- PLTW participants were more likely to enroll in math, life and physical sciences, industrial and technology, foreign language, and drafting courses than nonparticipants.

- Nonparticipants disproportionally enrolled in business, consumer and homemaking education, English language and literature, military science, social sciences, and history course at a higher rate.

Figure 11. Percent of Course Enrollments by NCES Course Area in High School



# Preliminary Conclusion

- PLTW students are more likely to be white, male, and strong in the area of math and sciences
  - A majority of participants are white male in all cohorts
  - PLTW students performed remarkable higher than their peers in math and science before enrolling in the program.
- PLTW students were more likely to enroll in math and science courses
- PLTW students performed better in summative tests before enrolling in the program and during high school (ITBS, ITEDs).

# Next Steps

- Propensity Score Matching
  - Reduce the effects of self-selection
  - Predicts students who are likely (or unlikely) to enroll in PLTW from enrollment records.
  - Distinguish the “causal link” between PLTW and educational outcomes.

# Questions & Comments?

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