

Student Participation and Postsecondary Outcomes: Specialized Courses in Science, Technology, Engineering and Mathematics

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2016 Annual Report

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Background

Project Lead the Way (PLTW) is a national organization that provides a science, technology, engineering and mathematics (STEM) curriculum for elementary through high school. Individual Washington high schools offered PLTW curricula as early as 1999¹. In recent years, the Office of Superintendent of Public Instruction (OSPI) has awarded grants to enhance offerings of PLTW curricula. These one-time awards may be used for the purchase of lab equipment and for professional development to integrate the advanced courses in schools².

In 2013 and 2014, two PLTW curricula were offered in participating Washington high schools. The *Engineering* curriculum consists of two foundation courses: Introduction to Engineering Design and Principles of Engineering. Specialization courses include Aerospace Engineering, Biotechnical Engineering, Civil Engineering and Architecture, Computer Integrated Manufacturing, Computer Science and Software Engineering, and Digital Electronics. The capstone course for Engineering is Engineering Design and Development.

The *Biomedical Science* curriculum consists of the foundation courses Principles of Biomedical Science, Human Body Systems and Medical Interventions. The capstone course for Biomedical Science is Biomedical Innovation. Participating high schools most often offer only a subset of all available courses in a curriculum.

School participation in PLTW requires an agreement signed by the superintendent or school board president with PLTW. There is also a participation fee that covers access to all program features for which a school has a trained teacher. The participation fee is assessed annually: \$3,000 for Engineering and \$2,000 for Biomedical Science.

RCW 28A.188.070 directs the Education Research and Data Center (ERDC) in the Office of Financial Management (OFM) to:

- Study mathematics and science course-taking patterns of students completing specialized STEM courses, including the extent to which completion of PLTW courses reduces mathematics remediation of students; and
- Follow the students to employment or further training and education in the two years following high school.

ERDC is to report the findings “to the governor, appropriate state agencies, and the appropriate education and fiscal committees of the legislature” in a series of annual reports from 2015 through 2018.

Complete two-year postsecondary enrollment and employment follow-up for 2013 PLTW graduates will be possible in the 2017 annual report. This report updates postsecondary enrollment follow-up and includes employment outcomes for the first full calendar year after high school graduation.

¹ Project Lead the Way www.pltw.org/

² OSPI Budget Provisos 2011–13 Biennium: Project Lead the Way
www.k12.wa.us/Finance/AgencyFinancialServices/Provisos/2013/EACodeQN2ProjectLeadtheWay.docx

The PLTW high school graduate cohort

Students may participate in PLTW courses throughout their high school career, so identification of PLTW participants involves (1) identifying PLTW courses at the high-school level, and (2) examining course-specific student enrollment over a period of four years for students in each high school graduation year cohort.

The first PLTW study cohort is students graduating in 2013 who completed at least one PLTW course between 2010 and 2013. OSPI's Comprehensive Education Data and Research System — specifically, the student grade history file — was used to identify students who completed PLTW courses.

Preliminary postsecondary enrollment follow-up (2015 update)

Postsecondary enrollment rates for the 2013 PLTW high school graduates have been updated based on data available to ERDC.

Table 1 summarizes one year of postsecondary education follow-up for 2013 PLTW graduates. Included in the postsecondary enrollment data are enrollments in the state's community and technical colleges (CTCs), Washington public four-year institutions, in-state private institutions and out-of-state institutions. Overall, 66 percent of PLTW graduates enrolled in postsecondary education in 2013–14. Overall postsecondary enrollment rates, as well as enrollment rates by type of institution, are related to high school grade point averages (GPA). PLTW graduates with GPAs in the 3.50 to 4.00 range attended mainly Washington public four-year institutions (47 percent) and in-state private or out-of-state institutions (37 percent).

Table 1: One-year postsecondary follow-up for 2013 PLTW high school graduates by high school GPA

GPA category	Postsecondary enrollment rate (2013-14)	Share of postsecondary enrollment (for students enrolled in 2013-14)		
		Washington CTC	Washington public four-year	Private and/or out-of-state institution
3.50-4.00	90%	21%	47%	37%
3.00-3.49	78%	39%	44%	20%
2.50-2.99	61%	62%	29%	14%
<2.50	38%	79%	10%	12%
Total	66%	42%	37%	23%

Note: Shares may not add to 100% because some students enrolled in more than one type of institution in 2013-14.

Typically, high school graduates with the highest GPA have the highest rates of postsecondary enrollment and the greatest tendency to enroll in either Washington public four-year institutions or in private or out-of-state institutions. This holds true for the PLTW graduates. Approximately 90 percent of PLTW graduates with a GPA of 3.50 or higher participated in postsecondary education in the year after high school graduation. Of those, 84 percent attended either a Washington public college/university or a private and/or out-of-state institution.

Table 2 shows college-going rates by PLTW program and gender. In general, participation in PLTW programs is higher for men than for women while postsecondary enrollment rates are higher for women than for men.

Table 2: One-year postsecondary follow-up by PLTW program and gender

PLTW curriculum	High school graduates (rounded)	Postsecondary enrollment rate			
		Any college	Washington CTC	Washington public four-year	Private and/or out-of-state
All Graduates	66,100	62%	27%	20%	14%
All PLTW Students	1,690	66%	42%	37%	23%
Male	1,150	64%	27%	23%	16%
PLTW Engineering	1,050	64%	26%	24%	15%
PLTW Biomedical	160	64%	31%	19%	18%
Female	540	71%	30%	27%	16%
PLTW Engineering	280	74%	31%	31%	15%
PLTW Biomedical	280	67%	29%	24%	18%

Note: Some students completed both Engineering and Biomedical courses. Some students attended more than one type of institution in 2013-14. Totals in programs may not add due to rounding.

Preliminary employment characteristics for 2014 (one-year follow-up)

Approximately 1,130 PLTW 2013 graduates were employed in 2014. Table 3 shows the median earnings of the graduates by postsecondary enrollment status and by the number of calendar quarters in 2015 in which they were employed. Individuals earning at least \$100 in a quarter are considered employed. Individuals working at least 30 hours per week are considered to be employed full-time.

Table 3: Earnings in 2014 by employment status

Enrollment status	Number of graduates (rounded)	Share of graduates	Median earnings (rounded)
Employed	1,130	100%	\$6,500
Employed 1 quarter	160	14%	\$1,800
Employed 2 quarters	250	22%	\$3,400
Employed 3 quarters	220	20%	\$6,000
Employed 4 quarters	490	44%	\$13,500
Employed full-time 4 quarters	70	6%	\$24,200
Not enrolled	390	35%	\$11,400
Employed 1 quarter	50	4%	\$1,600
Employed 2 quarters	60	5%	\$3,300
Employed 3 quarters	80	7%	\$8,200
Employed 4 quarters	210	19%	\$17,400
Employed full-time 4 quarters	50	5%	\$25,400
Enrolled	730	65%	\$5,000
Employed 1 quarter	120	10%	\$1,800
Employed 2 quarters	190	17%	\$3,500
Employed 3 quarters	150	13%	\$5,000
Employed 4 quarters	280	25%	\$10,900
Employed full-time 4 quarters	20	2%	\$20,800

Note: Totals in programs may not add due to rounding.

Many factors are in play in assessing employment outcomes, particularly for a group where many members are combining work with postsecondary enrollment. Table 3 shows that the median earnings of all employed PLTW graduates in 2014 was approximately \$6,500. For those not enrolled in postsecondary education, median earnings were \$11,400, more than twice the median of \$5,000 for those enrolled. Adding the number of quarters worked into the equation illustrates the obvious: Those working all four quarters in 2014 had significantly higher earnings than those working fewer quarters, and those working full-time for all four quarters had even higher earnings.

Table 4 displays earnings by industry group.

Table 4: Earnings in 2014 by industry group, enrollment status and employment status

Industry Group	All		Not Enrolled		Enrolled		Employed 4 Quarters	
	Count	Median	Count	Median	Count	Median	Count	Median
Natural Resources & Mining	50	\$4,300	*	*	*	*	*	*
Construction	50	\$6,900	30	\$17,100	30	\$4,300	20	\$22,000
Manufacturing	70	\$9,700	40	\$18,800	30	\$5,000	30	\$21,500
Trade, Transportation & Utilities	380	\$7,800	140	\$11,900	240	\$6,000	190	\$13,600
Information	*	*	*	*	*	*	*	*
Financial Activities	20	\$8,000	*	*	*	*	*	*
Professional & Business Services	80	\$5,600	30	\$14,700	50	\$2,900	30	\$15,100
Education & Health Services	90	\$6,600	30	\$10,700	60	\$5,700	40	\$13,200
Leisure & Hospitality	300	\$6,300	90	\$8,800	210	\$4,900	130	\$12,300
Other Services	40	\$4,800	*	*	*	*	*	*
Public Administration	30	\$5,100	*	*	*	*	*	*

An asterisk (*) indicate that information is suppressed because of low cell counts. Totals may not add due to rounding.

When employment and earnings are broken out by industry group, several things stand out:

- The two industry groups employing the greatest numbers in the 2013 cohort are Trade, Transportation & Utilities, which includes retail trade employment, and Leisure & Hospitality, which includes employment in restaurants.
- In each industry group, those enrolled in postsecondary education have lower earnings than those not enrolled, most likely because of fewer quarters worked and/or fewer hours worked per quarter.
- Highest median earnings for those not enrolled and for those employed four quarters in 2014 were in Construction and Manufacturing.
- Highest median earnings for postsecondary students were in Trade, Transportation & Utilities.

2017 and 2018 annual reports

The 2017 Annual Report will be the final report for 2013 high school graduates participating in PLTW. It will include a complete description of PLTW participant characteristics in high school, postsecondary mathematics and science course-taking, and a full two-year postsecondary education and employment follow-up.

The 2018 Annual Report will be the final report for 2014 high school graduates participating in PLTW.