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From Gateway to Project Lead the Way:

Tracking Middle School Engineering Participants into High School

Introduction

The Career and Technical Education (CTE) Department in the Austin Independent School District (AISD) administers a national engineering program in middle schools, called Gateway, and in high schools, called Project Lead the Way (PLTW). The Gateway program was designed to ignite students' passion for discovery, as the program engaged students in hands-on, collaborative problem-solving activities; focused on real-world challenges; and connected what students learn to their everyday life (Gateway, 2018). By introducing students to engineering concepts in middle and high schools, the CTE program provided students with an opportunity to be familiar with fields of study that can result in high-wage jobs that were currently and projected to be in high demand in the local and global economies.

In this summary, the PLTW courses taken during high school were examined for two cohorts of students who participated in the Gateway program at some point in their middle school years. Specifically, these two cohorts were eighth graders in 2011–2012 and 2012–2013, and thereafter high school seniors in 2015–2016 and 2016–2017, respectively. Schools that provided the Gateway and PLTW programs are listed in Table 1.

Table 1. Gateway Middle Schools From 2009–2010 Through 2012–2013 and the High Schools for Which They Are Feeder Schools

Gateway middle school	High school	Years of PLTW implementation in High School
Ann Richards	Ann Richards	2007–2017
Bailey	Bowie	No PLTW programs
Bedichek	Crockett	No PLTW programs
Garcia	LBJ	2006–2017
Martin	Eastside Memorial	2010–2016
Paredes	Akins	2005–2017
Pearce	LBJ	2006–2017
Small	Austin	2014–2017

Source. AISD district school records

Department of Research and Evaluation
Austin Independent School District

Findings

How many Gateway students enrolled in each Gateway and PLTW course?

Overall, the majority (79%) of Gateway students enrolled in the basic-level Gateway courses, and approximately half of them enrolled in advanced-level Gateway courses. Less than 15% of Gateway students enrolled in basic- and/or advanced-level of PLTW courses.

It appeared that Gateway students were more likely to enroll in basic-level courses if the school offered these courses. The Gateway courses were evenly distributed between basic-level and advanced-level courses. Of seven PLTW courses, only one course was basic level.

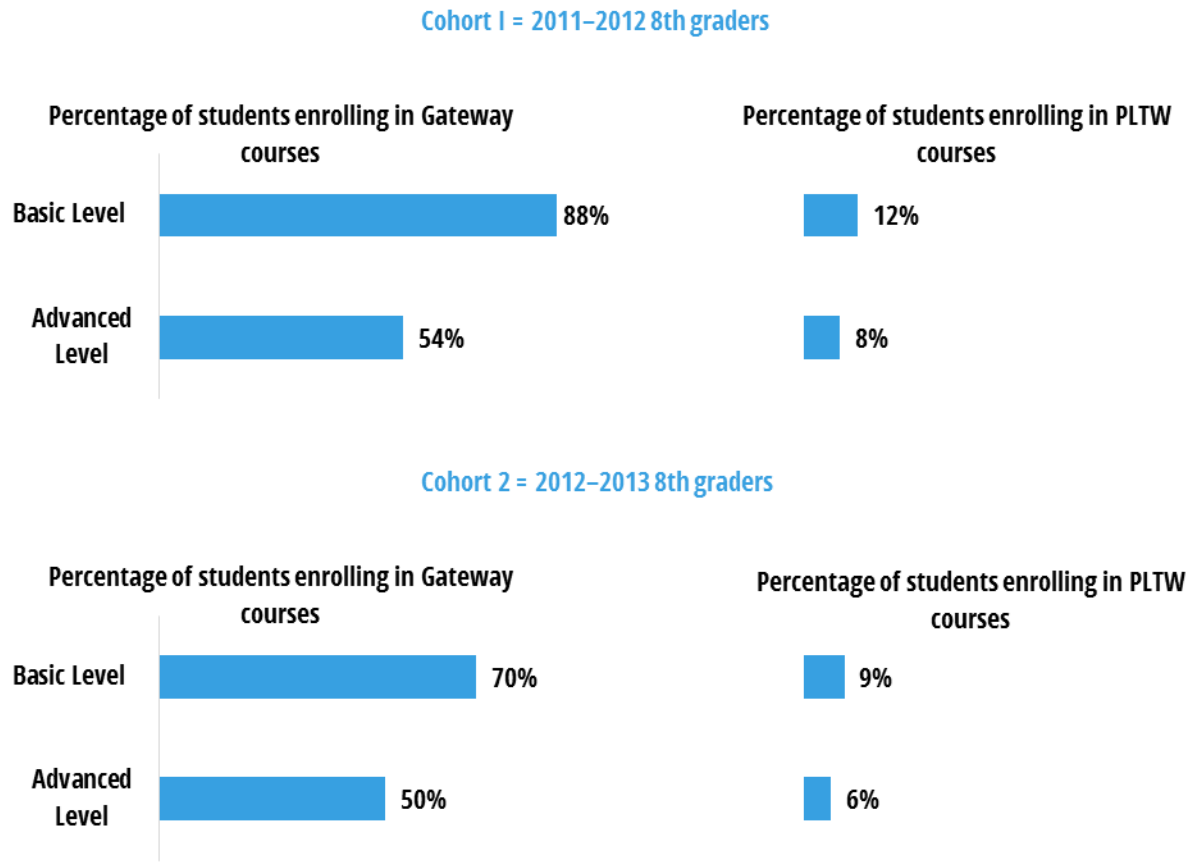
Table 2. Gateway Courses From 2009–2010 Through 2012–2013 and PLTW Courses From 2012–2013 Through 2016–2017

	Basic level	Advanced level
Gateway courses	Design and Modeling Automation and Robotics Science of Technology	Magic of Electrons Energy and the Environment Flight and Space
PLTW courses	Introduction to Engineering Design	Principles of Engineering Digital Electronics Aerospace Engineering Civil Engineering and Architecture Computer Integrated Manufacturing Engineering Design and Development

Source. AISD district course records

Figure 1.

Between 70% and 88% of Gateway students from both cohorts enrolled in the basic-level Gateway courses, and between 6% and 12% of Gateway students enrolled in PLTW courses, regardless of difficulty level.



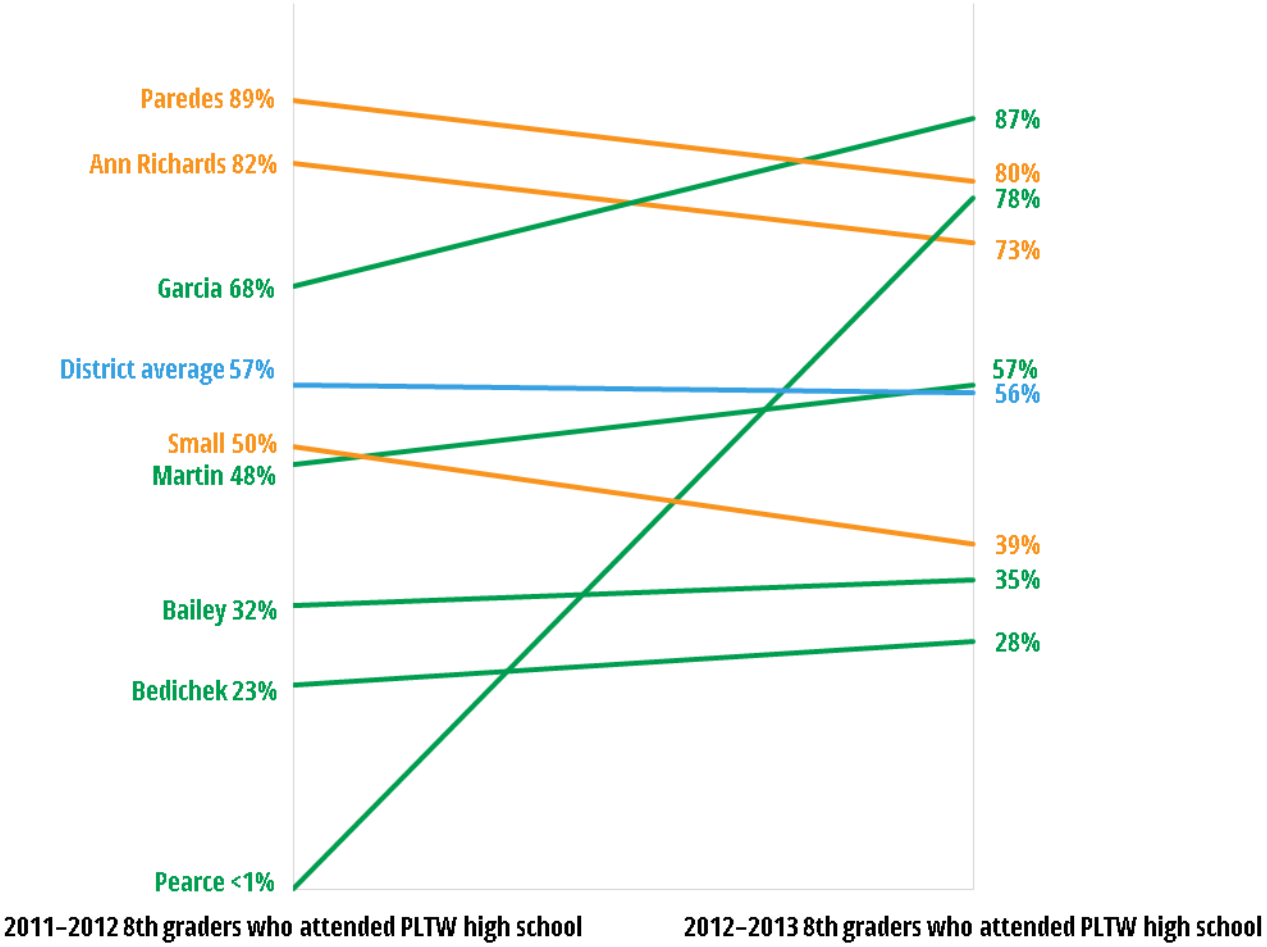
Source. AISD district enrollment and course records

Did Gateway 8th graders attend a PLTW high school?

More than 50% of Gateway 8th grade students attended a PLTW high school. Not all Gateway students, upon completing 8th grade, attended a high school that offered the PLTW program. Across Gateway middle schools, the percentage of students who enrolled in a PLTW high school was 57% for the 2011–2012 cohort and 56% for the 2012–2013 cohort. Across school years, PLTW high school enrollment was mixed for both cohorts. The percentage of the 2012–2013 cohort in Pearce who attended a PLTW high school was significantly greater than the percentage of the 2011–2012 cohort who did so. It appeared that 8th graders were more likely to attend a PLTW high school if their middle school fed into one. Bailey and Bedichek Middle Schools did not feed into a PLTW high school, and these schools had the lowest percentage of Gateway 8th graders attending a PLTW high school.

Figure 2.

At five Gateway middle schools, the percentage of 2012–2013 8th grade students who attended a PLTW high school was higher than that of 2011–2012 8th grade students.



Source. AISD district enrollment and course records

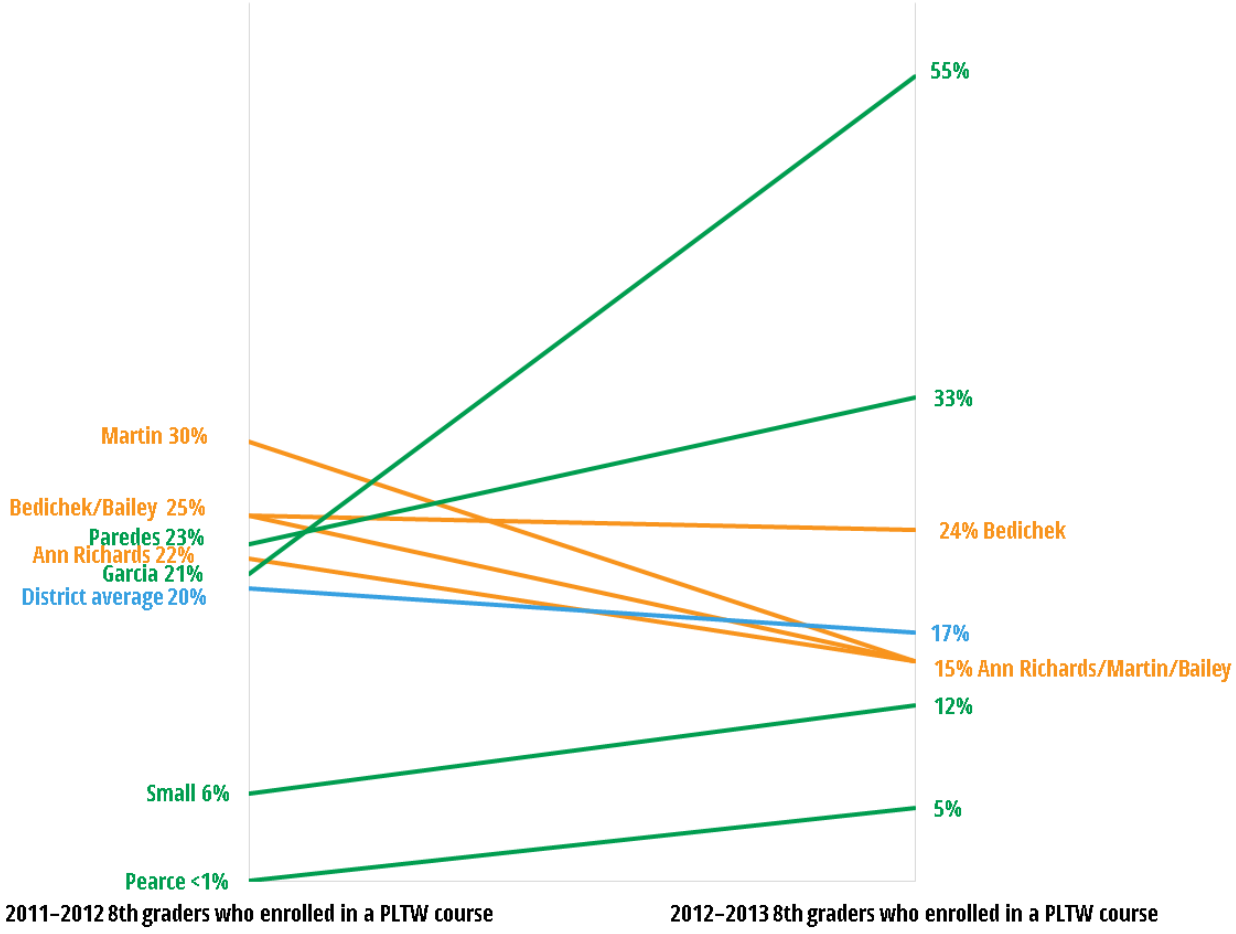
How many Gateway 8th graders took a PLTW course?

Overall, between 17% and 20% of all Gateway 8th graders who attended a PLTW high school took at least one PLTW course during their high school years. The percentage of 8th grade Gateway participants from each middle school who took a PLTW course in high school ranged from 30% to less than 1% for the 2011–2012 cohort and from 55% to 5% for the 2012–2013 cohort. The percentage of the 2012–2013 cohort in Garcia who took a PLTW course in high school was significantly greater than the percentage of the 2011–2012 cohort who did so.

Even though Pearce fed into LBJ, a PLTW high school, none of the Pearce 8th grade students in 2011–2012 took a Gateway course at any time during their middle school years. Therefore, no record shows Pearce 8th grade students in 2011–2012 attending a PLTW school.

Figure 3.

Of 8th graders at four Gateway middle schools who attended a PLTW high school, the percentage of 2012–2013 8th graders who took at least one PLTW course was higher than that of 2011–2012 8th graders who took at least one PLTW course.



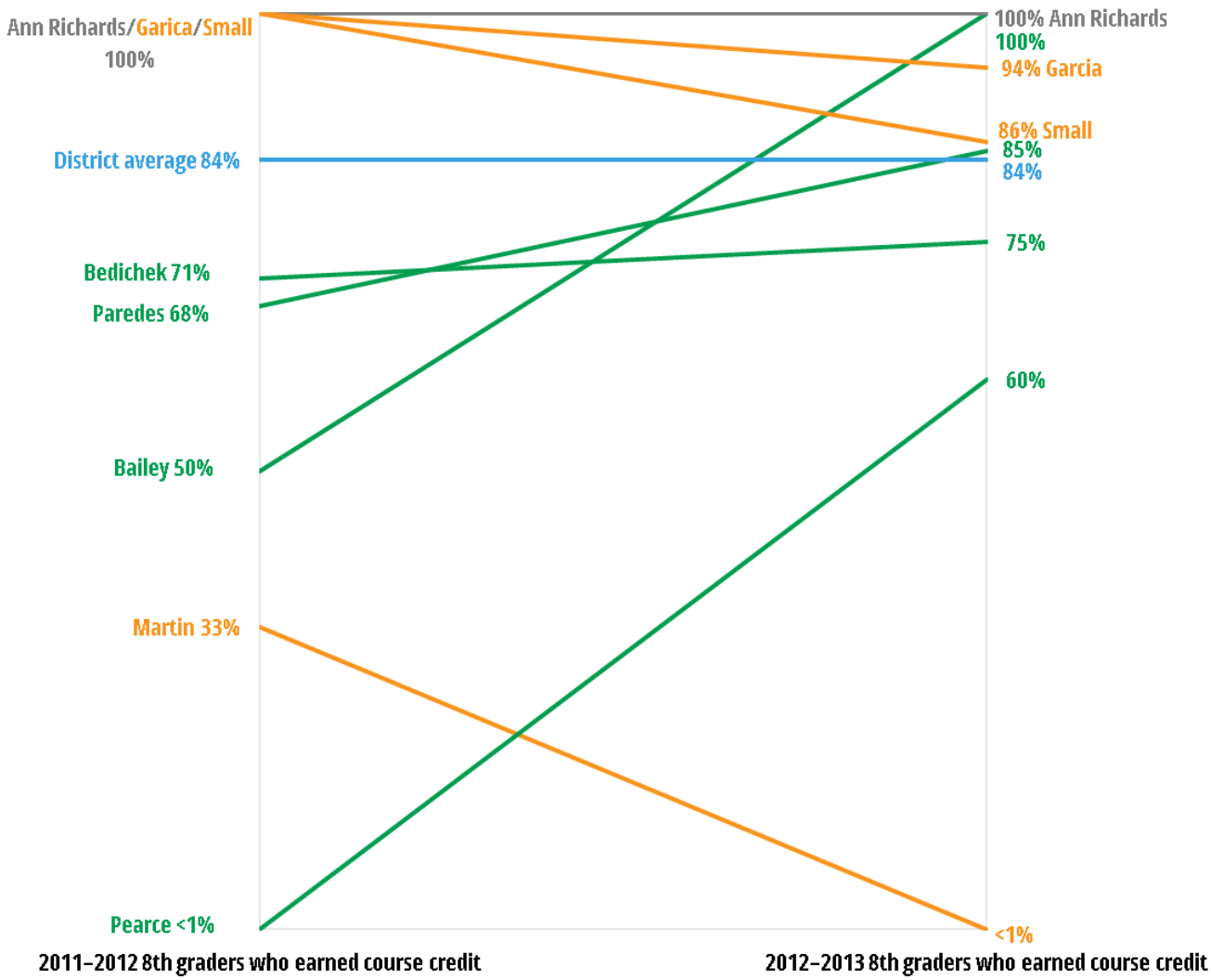
Source. AISD district enrollment and course records

How many Gateway 8th graders who took a PLTW course earned course credits?

More than 80% of Gateway students who took PLTW course(s) earned credits. The percentages of 8th grade Gateway students from the 2011–2012 and 2012–2013 cohorts who earned credit in one or more PLTW courses varied, based on their former middle school campuses. For Gateway participants who attended the Ann Richards School for Young Women Leaders, all students from both cohorts who took PLTW course(s) earned credits.

Figure 4.

Of 8th graders at four Gateway middle schools who took at least a PLTW course, the percentage of 2012–2013 8th graders who earned credits was higher than that of 2011–2012 8th graders who earned credits.



Source. AISD district enrollment and course records

Conclusion

Overall, more than half of Gateway 8th grade students in 2011–2012 (57%) and 2012–2013 (56%) attended a PLTW high school. Of Gateway 8th graders who attended a PLTW high school, the percentage of students who took at least one PLTW course during their high school years decreased from 20% in 2011–2012 to 17% in 2012–2013. However, of the Gateway 8th graders who took at least one PLTW course, the percentage of students from both cohorts who earned course credits remained high (>80%).

Multiple factors may have influenced PLTW course enrollment. Between 2009–2010 and 2010–2011, Gateway students typically enrolled in only two or three Gateway courses (out of 11 Gateway courses) in their middle schools. This may have limited the opportunities for PLTW course enrollment in high schools, and consequently, the percentage of Gateway students enrolling in high school PLTW courses. Also, a couple of the high school PLTW courses were not taken by any of the students between 2014–2015 and 2016–2017.

Although the percentage of Gateway students from some middle schools who attended a PLTW high school appeared to be high, the percentage of those Gateway students taking PLTW courses in high school was low. This might be related to the years of PLTW implementation in the high school. For example, Small Middle School offered Gateway courses from 2009–2010 through 2012–2013 for both cohorts, however, its feeder high school, Austin High School, did not offer PLTW courses until 2014–2015. Further investigation is needed to identify the barriers to middle school Gateway and high school PLTW course enrollment.

References

Gateway. (2018). *Curriculum*. Retrieved from https://www.pltw.org/our-programs/pltw-gateway-curriculum

Appendices

Across two years, the number of Gateway 8th-grade students attending eight middle schools increased by 33%, from 531 middle school students in 2011–2012 to 704 in 2012–2013 (Tables 1 and 2).

Table 1. 2011–2012 Gateway 8th Graders' Enrollment in PLTW Campus and Courses, From 2012–2013 Through 2015–2016

Gateway middle school	Number of 8th-grade Gateway students, 2011–2012	Gateway students who attended a PLTW campus		Gateway students attending a PLTW campus who took a PLTW course		Gateway students taking a PLTW course who earned a course credit	
		n	%	n	%	n	%
Ann Richards	130	106	82%	23	22%	23	100%
Bailey	50	16	32%	4	25%	2	50%
Bedichek	122	28	23%	7	25%	5	71%
Garcia	22	15	68%	3	21%	3	100%
Martin	21	10	48%	3	30%	1	33%
Paredes	91	81	89%	19	23%	13	68%
Pearce	0	0	0%	0	0%	0	0%
Small	95	47	50%	3	6%	3	100%
Total	**531**	**303**	**57%**	**62**	**20%**	**50**	**81%**

Source. AISD district enrollment and course records

Note. Pearce did not become Sadler Means YWLA until 2014–2015.

Table 2. 2012–2013 Gateway 8th Graders' Enrollment in PLTW Campus and Courses, From 2013–2014 Through 2016–2017

Gateway middle school	Number of 8th-grade Gateway students, 2012–2013	Gateway students who attended a PLTW campus		Gateway students attending a PLTW campus who took a PLTW course		Gateway students taking a PLTW course who earned a course credit	
		n	%	n	%	n	%
Ann Richards	113	82	73%	12	15%	12	100%
Bailey	57	20	35%	3	15%	3	100%
Bedichek	116	33	28%	8	24%	6	75%
Garcia	38	33	87%	18	55%	17	94%
Martin	35	20	57%	3	15%	0	0%
Paredes	49	39	80%	13	33%	11	85%
Pearce	138	108	78%	5	5%	3	60%
Small	158	61	39%	7	12%	6	86%
Total	**704**	**396**	**56%**	**69**	**17%**	**58**	**84%**

Source. AISD district enrollment and course records

Note. Pearce did not become Sadler Means YWLA until 2014–2015.

Table 3. Gateway and PLTW Courses With Enrollment by Two Cohorts at Each Gateway School

Gateway middle school	Gateway courses enrolled by 2011–2012 8th graders	Gateway courses enrolled by 2012–2013 8th graders	PLTW courses enrolled by 2011–2012 8th graders	PLTW courses enrolled by 2012–2013 8th graders
Ann Richards	Design and Modeling/Science of Technology/Automation and Robotics (018855R) Magic of Electrons/ Automation and Robotics/Energy and the Environment (018857R)	Magic of Electrons/ Automation and Robotics/Energy and the Environment (018857R) Magic of Electrons/Energy and the Environment (018859R)	Introduction to Engineering Design (8760.HT0C.Y) Principles of Engineering (8762.HT0C.Y) Digital Electronics (8764.HT0C.Y) Aerospace Engineering (8766.HT0C.Y) Computer Integrated Manufacturing (8770.HT0C.Y) Engineering Design and Development (8772.HT0C.Y)	Introduction to Engineering Design (8760.HT0C.Y) Principles of Engineering (8762.HT0C.Y) Digital Electronics (8764.HT0C.Y) Engineering Design and Development (8772.HT0C.Y)
Bailey	Design and Modeling/Science of Technology/Automation and Robotics (018855R)	Design and Modeling/Science of Technology/Automation and Robotics (018855R) Magic of Electrons/ Automation and Robotics/Energy and the Environment (018857R) Magic of Electrons/ Energy and the Environment (8856.RJC00.X)	Introduction to Engineering Design (8760.HT0C.Y) Principles of Engineering (8762.HT0C.Y) Digital Electronics (8764.HT0C.Y) Computer Integrated Manufacturing (8770.HT0C.Y) Engineering Design and Development (8772.HT0C.Y)	Introduction to Engineering Design (8760.HT0C.Y) Principles of Engineering (8762.HT0C.Y) Aerospace Engineering (8766.HT0C.Y)
Bedichek	Design and Modeling/Science of Technology/Automation and Robotics (018855R) Magic of Electrons/	Design and Modeling/Science of Technology/Automation and Robotics (018855R) Magic of Electrons/	Introduction to Engineering Design (8760.HT0C.Y) Principles of Engineering	Introduction to Engineering Design (8760.HT0C.Y) Principles of Engineering (8762.HT0C.Y)

Gateway middle school	Gateway courses enrolled by 2011–2012 8th graders	Gateway courses enrolled by 2012–2013 8th graders	PLTW courses enrolled by 2011–2012 8th graders	PLTW courses enrolled by 2012–2013 8th graders
	Automation and Robotics/Energy and the Environment (018857R) Energy/Flight and Space (018865R)	Automation and Robotics/Energy and the Environment (018857R) Flight and Space/Science of Technology (018864R) Design and Modeling/ Automation and Robotics (8852.RJC00.X) Magic of Electrons/ Energy and the Environment (8856.RJC00.X)	(8762.HT0C.Y) Digital Electronics (8764.HT0C.Y) Aerospace Engineering (8766.HT0C.Y) Civil Engineering and Architecture (8768.HT0C.Y) Computer Integrated Manufacturing (8770.HT0C.Y) Engineering Design and Development (8772.HT0C.Y)	Digital Electronics (8764.HT0C.Y) Aerospace Engineering (8766.HT0C.Y) Computer Integrated Manufacturing (8770.HT0C.Y) Engineering Design and Development (8772.HT0C.Y)
Garcia	Design and Modeling/ Automation and Robotics (018852R) Design and Modeling/Science of Technology/Automation and Robotics (018855R)	Design and Modeling/ Automation and Robotics (018852R) Design and Modeling/ Automation and Robotics (018853R) Design and Modeling/Science of Technology/Automation and Robotics (018855R) Electrons/Energy and the Environment (018859R) Design and Modeling/ Automation and Robotics (8852.RJC00.Y) Magic of Electrons/ Energy and the Environment (8856.RJC00.Y)	Introduction to Engineering Design (8760.HT0C.Y) Principles of Engineering (8762.HT0C.Y) Digital Electronics (8764.HT0C.Y)	Introduction to Engineering Design (8760.HT0C.Y) Principles of Engineering (8762.HT0C.Y) Digital Electronics (8764.HT0C.Y)
Martin	Design and Modeling/Science of Technology/Automation and Robotics (018854R)	Design and Modeling/ Automation and Robotics (018853R) Design and	Introduction to Engineering Design (8760.HT0C.Y) Principles of	Introduction to Engineering Design (8760.HT0C.Y)

Gateway middle school	Gateway courses enrolled by 2011–2012 8th graders	Gateway courses enrolled by 2012–2013 8th graders	PLTW courses enrolled by 2011–2012 8th graders	PLTW courses enrolled by 2012–2013 8th graders
	Energy and the Environment (018866R)	Modeling/Science of Technology/Automation and Robotics (018855R) Magic of Electrons/ Automation and Robotics/Energy and the Environment (018857R) Design and Modeling/ Automation and Robotics (8852.RJC00.Y)	Engineering (8762.HT0C.Y)	
Paredes	Design and Modeling/Science of Technology/Automation and Robotics (018855R) Magic of Electrons/ Automation and Robotics/Energy and the Environment (018857R)	Design and Modeling/ Automation and Robotics (018852R) Design and Modeling/Science of Technology/Automation and Robotics (018855R) Magic of Electrons/ Automation and Robotics/Energy and the Environment (018857R)	Introduction to Engineering Design (8760.HT0C.Y) Principles of Engineering (8762.HT0C.Y) Digital Electronics (8764.HT0C.Y) Aerospace Engineering (8766.HT0C.Y) Civil Engineering and Architecture (8768.HT0C.Y) Computer Integrated Manufacturing (8770.HT0C.Y) Engineering Design and Development (8772.HT0C.Y)	Introduction to Engineering Design (8760.HT0C.Y) Principles of Engineering (8762.HT0C.Y) Digital Electronics (8764.HT0C.Y) Aerospace Engineering (8766.HT0C.Y) Civil Engineering and Architecture (8768.HT0C.Y) Computer Integrated Manufacturing (8770.HT0C.Y) Engineering Design and Development (8772.HT0C.Y)
Pearce		Design and Modeling/Science of Technology/Automation and Robotics (018855R)		Introduction to Engineering Design (8760.HT0C.Y) Principles of Engineering (8762.HT0C.Y) Digital Electronics (8764.HT0C.Y)

Gateway middle school	Gateway courses enrolled by 2011–2012 8th graders	Gateway courses enrolled by 2012–2013 8th graders	PLTW courses enrolled by 2011–2012 8th graders	PLTW courses enrolled by 2012–2013 8th graders
Small	Design and Modeling/Science of Technology/Automation and Robotics (018855R) Automation and Robotics (018860R) Energy/Flight and Space (018865R) Energy and the Environment (018866R)	Design and Modeling/ Automation and Robotics (018852R) Automation and Robotics (018860R) Energy/Flight and Space (018865R) Energy and the Environment (018866R) Design and Modeling/ Automation and Robotics (8852.RJC00.Y) Magic of Electrons/ Energy and the Environment (8856.RJC00.X) Flight and Space/Science of Technology (8863.RJC00.X)	Introduction to Engineering Design (8760.HT0C.Y) Principles of Engineering (8762.HT0C.Y)	Introduction to Engineering Design (8760.HT0C.Y) Principles of Engineering (8762.HT0C.Y) Civil Engineering and Architecture (8768.HT0C.Y)

Source. AISD district enrollment and course record

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