The School District of Philadelphia

The Office of Research and Evaluation

Career and Technical Education (CTE) Program Evaluation

Evaluation Report

2014

The School District of Philadelphia
Career and Technical Education (CTE)
Evaluation Report

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The Office of Career and Technical Education

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Executive Summary

The mission of the School District of Philadelphia's (SDP) Career and Technical Education (CTE) office is to deliver high quality CTE programs that provide students with the opportunity to acquire the appropriate academic and technical skills to be prepared for the high-skill, high-wage, and high-priority occupations of a competitive 21st century global economy. SDP's *Five-Year Strategic Plan for Career and Technical Education* aligns with the broader District goal of improving academic outcomes for students in all public and charter schools, and aims to "improve the quality, access and equity for Career and Technical Education Programs and Career Academies across the entire district."

Through its CTE office, SDP offers 111 CTE programs in 37 occupational areas. These programs are offered in 28 high schools across the District and are organized as part of 10 Career Clusters in order to provide students with relevant contexts for studying and learning. Each Career Cluster represents a distinct grouping of occupations and industries based on the knowledge and skills they require.

The School District of Philadelphia's state-approved CTE programs are typically three-year programs of study that provide 1,080 hours of instruction and afford students the opportunity to earn recognized industry certifications. Programs typically begin in grade 10 and continue through grade 12, with an end-of-program assessment (NOCTI) that is administered in grade 12.

This report examined the District's 2010-2011 first time 9th grade cohort, and compared high school progression and four-year graduation outcomes for CTE and non-CTE students, with the following major findings:

- **CTE students graduated at a significantly higher rate than non-CTE students.** Overall, 65% of the District's 2010-2011 first time 9th grade cohort graduated within four years. Within that cohort, 84% of CTE students graduated in four years compared with 62% of non-CTE students.

- **CTE students left the District at a significantly lower rate than non-CTE students.** Twelve percent of the overall cohort left the District within the four-year span, and is considered "non-drop departure." Thirteen percent of non-CTE students in the cohort transferred out of the District, compared to only 5% of CTE students. This suggests that CTE students and their families are more satisfied with their educational options, and thus are less likely to seek out educational options outside of the state, city, or district.

- **There is little-to-no "achievement gap" among CTE students in terms of graduation rates.** In the overall cohort, the graduation rates for African American and Latino students is 62%, compared to 75% for White and Asian students – a 13 percentage point gap. Among CTE students only, African American and Latino students graduated at a rate of 83%, and White and Asian students at a rate of 86% - a 3 percentage point gap.

Introduction

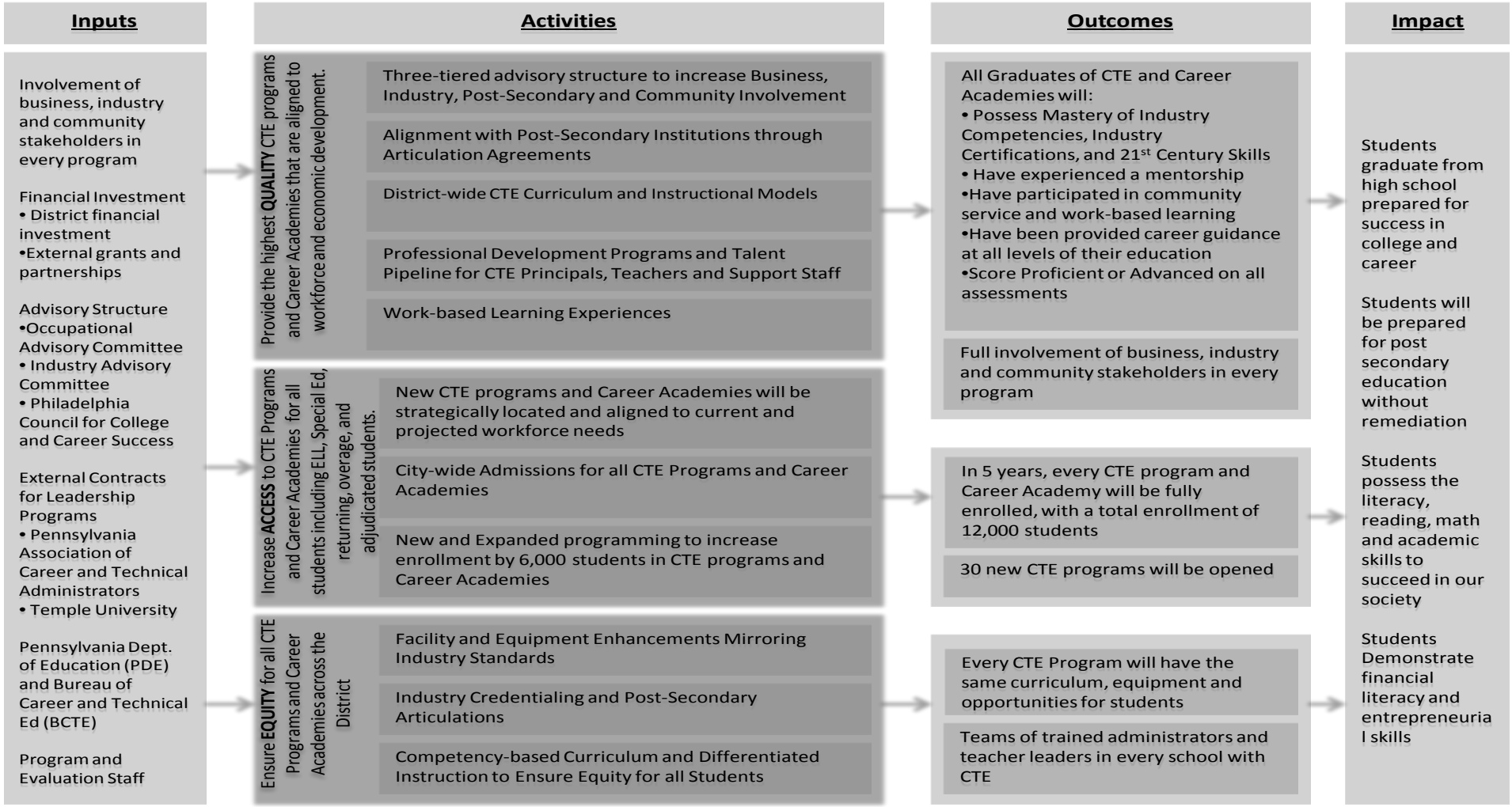
Career and Technical Education (CTE) programs are designed to equip high school students with the technical skills needed to enter the job market upon graduation. Nationally, 14 million students are enrolled in CTE programs in approximately 1,300 high schools and 1,700 two-year colleges. CTE evolved from vocational programs, and in recent years there has been an effort on the part of CTE educators and leaders to not only prepare students for jobs, but also equip them with academic skills necessary for pursuing post-secondary education (National Center for Career and Technical Education 2005). CTE programs are primarily funded by the *Carl D. Perkins Career and Technical Education Improvement Act* (Perkins IV), a federal mandate. Ninety percent of these funds are appropriated through basic grants with which states can make spending decisions according to their unique needs.

A career-related education provides a means for acquiring skills that are valued by employers: academic skills, technological skills, and basic work behaviors. Teaching these skills in a vocational context is an effective means of engaging some students in learning who would not otherwise be so engaged (Cohen and Besharov, 2002). In the past decade, there has been a push within the CTE community to create coursework geared toward "career clusters" (e.g. agriculture, architecture, and health science). Many believe that providing such focused programs of study is a critical lever for student success (National Association of State Directors of Career Technical Education Consortium, 2012). CTE programs have also been seen as a viable means of preventing high school drop-out and promoting attendance, especially for high-risk youth.

The existing body of research on CTE programming focuses on job readiness, accountability measures, teacher preparedness, and curricula's ability to prepare students to be competitive in the global economy. Over the last decade, federal legislation has mandated greater accountability requirements for local CTE programs (Castellano and Stringfield 2003). Such requirements include rigorous academic standards and curricula aligned to the skills needed in today's economy.

The mission of the School District of Philadelphia's (SDP) Career and Technical Education (CTE) office is to deliver high quality CTE programs that provide students with the opportunity to acquire the appropriate academic and technical skills to be prepared for the high-skill, high-wage, and high-priority occupations of a competitive 21st century global economy. SDP's *Five-Year Strategic Plan for Career and Technical Education* aligns with the broader District goal of improving academic outcomes for students in all public and charter schools, and aims to "improve the quality, access and equity for Career and Technical Education Programs and Career Academies across the entire district." The logic model in Figure 1, below, represents the inputs, activities, outcomes, and desired impacts of SDP's CTE programs.

Career and Technical Education (CTE) Logic Model
The School District of Philadelphia



Through the CTE office, SDP offers 111[1] CTE programs in 37 occupational areas. These programs are offered in 28 high schools[2] across the District and are organized as part of 10 Career Clusters in order to provide students with relevant contexts for studying and learning. Each Career Cluster represents a distinct grouping of occupations and industries based on the knowledge and skills they require.

The School District of Philadelphia's state-approved CTE programs are typically three-year programs of study that provide 1,080 hours of instruction and afford students the opportunity to earn recognized industry certifications. Programs typically begin in grade 10 and continue through grade 12, with an end-of-program assessment (NOCTI) that is administered in grade 12.[3] Most of SDP's CTE programs follow a similar course sequence over three years.[4] For example, the *Commercial and Advertising Art Program* consists of the following courses:

Grade	Course
10	Commercial and Advertising Art 1
11	Commercial and Advertising Art 2
12	Commercial and Advertising Art 3

The grid in Figure 2 displays CTE course sequencing by school for 2013-2014. Programs coded with a '123' indicate that the program at a particular school offered Course 1, Course 2, and Course 3, as described in the previous paragraph. The spaces displaying '12' indicate a school offered Course 1 and Course 2 of a program during the 2013-2014 school year. This occurred if the program was new at the school in 2012-2013, and therefore did not yet have any students who have reached Course 3. Programs coded '23' only offer Course 2 and Course 3 of a program this year. This is the case for the *Cinematography and Film/Video Production* program at Kensington CAPA. The entire program was transferred from a school that was closed at the end of 2012-2013. The programs coded '1' indicate a school is only offering Course 1 of a program during the 2013-2014 school year. This is generally the case for programs that were new, such as the *Accounting* program at Furness and the *Building/Property Maintenance* program at Overbrook.

[1] This count DOES NOT include the following programs: Automotive Mechanics at Martin Luther King HS, which is a state-approved program, but was not offered in 2013-2014 due to staffing changes; Welding at Swenson High School, which was state-approved mid-way through the 2013-2014 school year, and did not have any students currently enrolled; and programs that were being offered in 2013-2014 but are not yet state-approved (Cinematography at Science Leadership Academy, Culinary Arts at Ben Franklin HS, Engineering at Workshop School, and Biotechnology at Roxborough HS). The count DOES include Business Technology and Health Related Technology Programs offered at Franklin Learning Center, which are not captured in the District's Data Warehouse system due to FLC's use of a different central data system.

[2] Count does not include SLA or Ben Franklin HS, which were offering new programs that are not yet state-approved.

[3] Some programs do not have a NOCTI exam aligned with the program and SDP receives a waiver exempting students from the end of program assessment. The state is still developing new NOCTI exams for those programs for which they currently issue waivers.

[4] Northeast High School's *Communications Technology* program is an exception to this sequence; students take a cluster of six, one-credit courses.

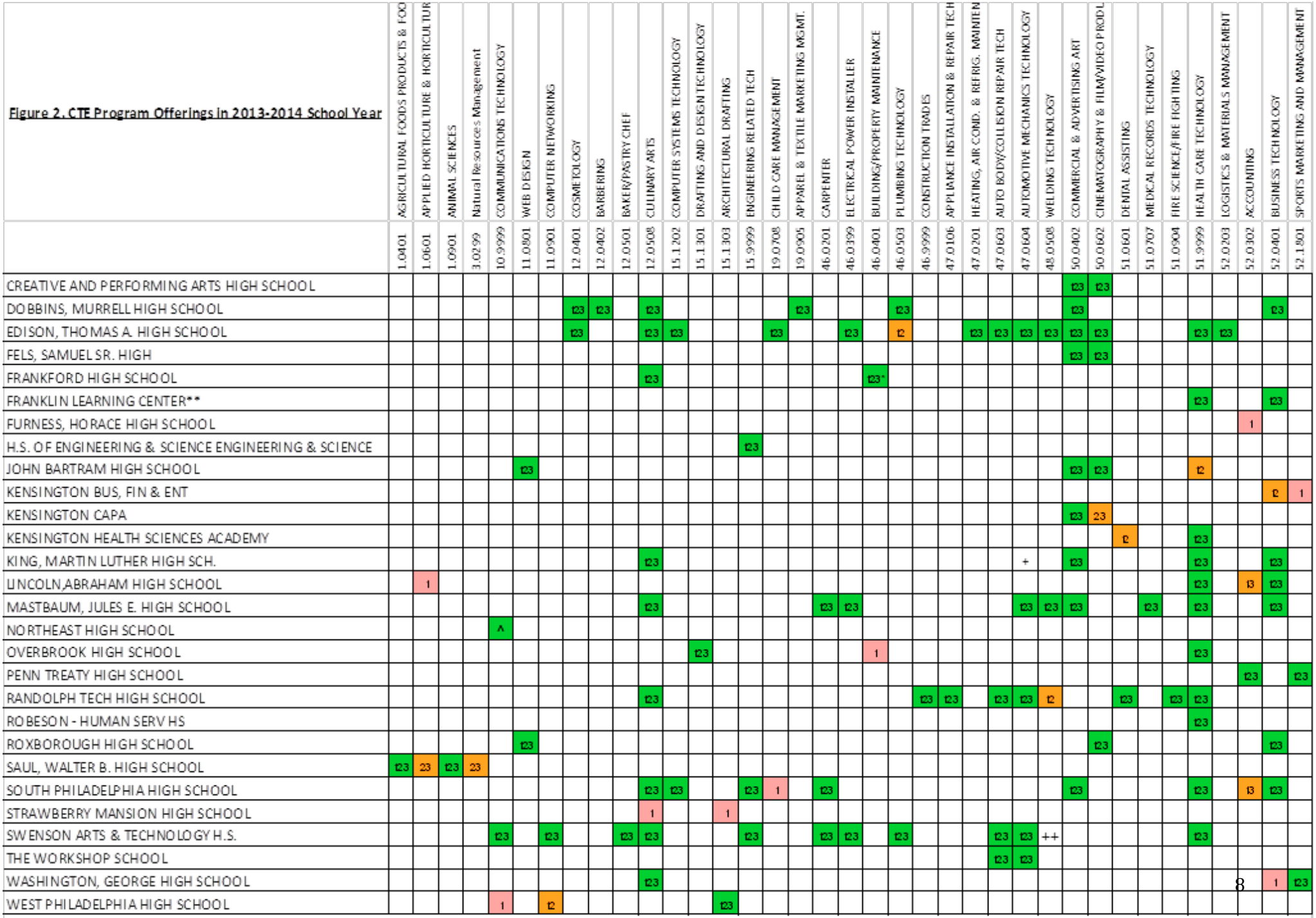


Figure 2. CTE Program Offerings in 2013-2014 School Year

	AGRICULTURAL FOODS PRODUCTS & FOO	APPLIED HORTICULTURE & HORTICULTUR	ANIMAL SCIENCES	Natural Resources Management	COMMUNICATIONS TECHNOLOGY	WEB DESIGN	COMPUTER NETWORKING	COSMETOLOGY	BARBERING	BAKER/PASTRY CHEF	CULINARY ARTS	COMPUTER SYSTEMS TECHNOLOGY	DRAFTING AND DESIGN TECHNOLOGY	ARCHITECTURAL DRAFTING	ENGINEERING RELATED TECH	CHILD CARE MANAGEMENT	APPAREL & TEXTILE MARKETING MGMT.	CARPENTER	ELECTRICAL POWER INSTALLER	BUILDING/PROPERTY MAINTENANCE	PLUMBING TECHNOLOGY	CONSTRUCTION TRADES	APPLIANCE INSTALLATION & REPAIR TECH	HEATING, AIR COND. & REFRIG. MAINTEN	AUTO BODY/COLLISION REPAIR TECH	AUTOMOTIVE MECHANICS TECHNOLOGY	WELDING TECHNOLOGY	COMMERCIAL & ADVERTISING ART	CINEMATOGRAPHY & FILM/VIDEO PRODU	DENTAL ASSISTING	MEDICAL RECORDS TECHNOLOGY	FIRE SCIENCE/FIRE FIGHTING	HEALTH CARE TECHNOLOGY	LOGISTICS & MATERIALS MANAGEMENT	ACCOUNTING	BUSINESS TECHNOLOGY	SPORTS MARKETING AND MANAGEMENT
	1.0401	1.0601	1.0901	3.0299	10.9999	11.0801	11.0901	12.0401	12.0402	12.0501	12.0508	15.1202	15.1301	15.1303	15.9999	19.0708	19.0905	46.0201	46.0399	46.0401	46.0503	46.9999	47.0106	47.0201	47.0603	47.0604	47.0508	50.0402	50.0602	51.0601	51.0707	51.0904	51.9999	52.0203	52.0302	52.0401	52.1801
CREATIVE AND PERFORMING ARTS HIGH SCHOOL																												t23	t23								
DOBBINS, MURRELL HIGH SCHOOL								t23	t23		t23						t23				t23							t23								t23	
EDISON, THOMAS A. HIGH SCHOOL								t23			t23	t23				t23			t23		t2			t23	t23	t23	t23	t23	t23				t23	t23			
FELS, SAMUEL SR. HIGH																												t23	t23								
FRANKFORD HIGH SCHOOL											t23									t23*																	
FRANKLIN LEARNING CENTER**																																	t23			t23	
FURNESS, HORACE HIGH SCHOOL																																			1		
H.S. OF ENGINEERING & SCIENCE ENGINEERING & SCIENCE															t23																						
JOHN BARTRAM HIGH SCHOOL						t23																						t23	t23				t2				
KENSINGTON BUS, FIN & ENT																																				t2	1
KENSINGTON CAPA																												t23	23								
KENSINGTON HEALTH SCIENCES ACADEMY																														t2			t23				
KING, MARTIN LUTHER HIGH SCH.											t23															+		t23					t23			t23	
LINCOLN,ABRAHAM HIGH SCHOOL		1																															t23		13	t23	
MASTBAUM, JULES E. HIGH SCHOOL											t23							t23	t23							t23	t23	t23			t23		t23			t23	
NORTHEAST HIGH SCHOOL					^																																
OVERBROOK HIGH SCHOOL													t23							1													t23				
PENN TREATY HIGH SCHOOL																																			t23		t23
RANDOLPH TECH HIGH SCHOOL											t23											t23	t23		t23	t23	t2			t23		t23	t23				
ROBESON - HUMAN SERV HS																																	t23				
ROXBOROUGH HIGH SCHOOL						t23																							t23							t23	
SAUL, WALTER B. HIGH SCHOOL	t23	23	t23	23																																	
SOUTH PHILADELPHIA HIGH SCHOOL											t23	t23			t23	1		t23										t23					t23		13	t23	
STRAWBERRY MANSION HIGH SCHOOL											1			1																							
SWENSON ARTS & TECHNOLOGY H.S.					t23		t23			t23	t23				t23			t23	t23		t23				t23	t23	++					t23				
THE WORKSHOP SCHOOL																									t23	t23										
WASHINGTON, GEORGE HIGH SCHOOL											t23																									1	t23
WEST PHILADELPHIA HIGH SCHOOL					1		t2							t23																							

*Frankford's data reflects only one course offered in this sequence, however this was determined to be a rostering error that will be corrected moving forward.

**Franklin Learning Center currently does not use the District's central data system, and therefore none of their students are coded as being in CTE courses in the EDS.

^Northeast's program sequence is structured differently, offering a cluter of 6 courses, rather than 3.

+ King has a state-approved Automotive Mechanic Program, but it is not offered in 2013-2014 due to staffing changes

++ Swenson has a new Welding program that was state-approved mid-way through the 2013-2014 school year, and does not have students enrolled in 2013-2014.

Cohort Definitions and Comparisons

This report will analyze student-level outcomes related to CTE participation, focusing on graduation from high school and factors impacting levels of CTE participation.

This analysis focuses solely on the District's 2010-2011 first-time 9th grade cohort of students. These are students who were in grade 9 in a District K-12 school for the first time in 2010-2011, and would have been expected to graduate on-time at the end of the 2013-2014 school year.[5][6] Any reference in this report to 'students,' 'cohort students,' or any iteration thereof, only refers to students in this 2010-2011 cohort. For the purpose of this analysis, all students were attributed to their last school of record. The typical academic trajectory for a CTE student in the cohort studied is as follows:

School Year	CTE Participation
2010-2011	First time 9th Grade Cohort (No CTE Course)
2011-2012	CTE Course #1
2012-2013	CTE Course #2
2013-2014	CTE Course #3 and graduation

This report divides the cohort into two groups of students: **CTE students** and **non-CTE students**. For the purpose of this report, a student was categorized as a CTE student if:

- The student was enrolled in a CTE course in 2012-2013, 2013-2014, or in both school years;[7] or
- The student's last school of record was one of the District's five all-CTE high schools.[8]

A student was categorized as a non-CTE student if:

- The student was not enrolled in any CTE program during 2012-2013 or 2013-2014; and
- The student's last school of record was not one of the District's five all-CTE high schools.

Later in the report, CTE students are further grouped based on their trajectory through a CTE program, and classified as follows:

- **On-Track CTE -** Student enrolled in a CTE course in SYs 2012-2013 **and** 2013-2014;
- **Drop CTE -** Student enrolled in CTE course in SY 2012-2013, but **not** 2013-2014;
- **Late-Start CTE** - Student enrolled in CTE course in SY 2013-2014, but **not** 2012-2013;
- **Non-Start CTE** - Student not enrolled in CTE course in either SY 2012-2013 or 2013-2014, but last school of record was an all-CTE School.

[5] The cohort did not include students who started their first time 9th grade year in a Charter or Alternative school.
[6] The District recently adopted a new methodology for calculating the local graduation rate, which counts all students who transferred into the District in between their 9th and 12th grade years towards the graduation rate. Therefore, the District graduation rates and cohort sizes cited in this report may be slightly different than the District's graduation rate.
[7] Ideally, this analysis would have identified students who participated in CTE 2011-2012. However the District's Education Data Warehouse (EDW) only began flagging CTE courses beginning in 2012-2013.
[8] Dobbins, Mastbaum, Randolph, Saul, and Swenson

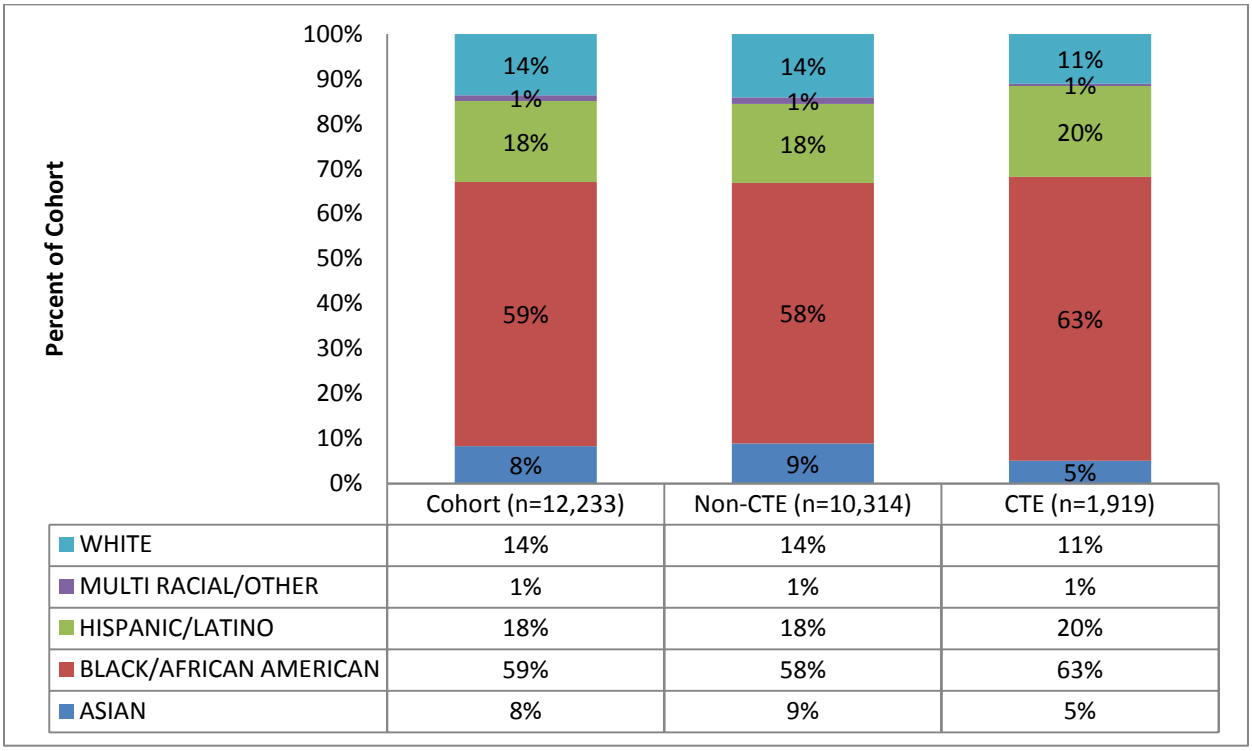
CTE Students Compared to Non-CTE Students

Demographics and Prior Performance

The 2010-2011 first-time 9th grade cohort consisted of 12,233 students.[9][10] Of this cohort, 1,919 students (16%) were CTE students. The remainder—10,314 students (84%), were non-CTE students.

The CTE population had a higher percentage of Black/African American and Hispanic/Latino students than the general cohort, and a smaller percentage of White and Asian students than the general cohort and the non-CTE population. The ethnicity distribution across CTE students, non-CTE students, and the overall cohort is shown in Figure 3.

Figure 3. 2010-2011 9th Grade Cohort Demographic Breakdown by Ethnicity



	Cohort (n=12,233)	Non-CTE (n=10,314)	CTE (n=1,919)
WHITE	14%	14%	11%
MULTI RACIAL/OTHER	1%	1%	1%
HISPANIC/LATINO	18%	18%	20%
BLACK/AFRICAN AMERICAN	59%	58%	63%
ASIAN	8%	9%	5%

[9] The cohort did not include students who started their first time 9th grade year in a Charter or Alternative school.
[10] Source: School District of Philadelphia Strategic Analytics 2010-11 Graduation File.

Table 1 shows the descriptive breakdown for other demographic variables, including Gender, Individual Education Plan (IEP) Status, and English Language Learner (ELL) Status. Among CTE students, the percentages of females, students with an IEP, and ELL students were slightly lower than in the overall cohort.

Table 1. 2010-2011 9th Grade Cohort Demographic Breakdown by Gender, IEP Status and ELL Status

Demographic Indicator	Category	Cohort	Non-CTE	CTE
Gender	Male	51%	50%	55%
	Female	49%	50%	45%
IEP Status	IEP	16%	17%	14%
	No IEP	84%	83%	86%
ELL Status	ELL	9%	9%	8%
	Not ELL	91%	91%	92%

Table 2 represents a further breakdown of these demographic variables by Career Cluster. These data demonstrate the varying distributions of certain demographics within different Career Clusters.

Table 2. CTE Student Demographics by Career Cluster

Career Cluster	Total Students	Female		IEP		ELL		Black or Latino		Cluster % of all CTE
		#	%	#	%	#	%	#	%	
Business and Finance	262	107	41%	24	9%	22	8%	197	75%	14%
Communications & Graphics	358	149	42%	53	15%	28	8%	297	83%	19%
Agriculture	108	67	62%	11	10%	1	1%	86	80%	6%
Construction	192	23	12%	29	15%	13	7%	164	85%	10%
Transportation	121	10	8%	30	25%	11	9%	100	83%	6%
Human Services	92	79	86%	12	13%	8	9%	91	99%	5%
Hospitality	276	173	63%	44	16%	21	8%	241	87%	14%
Health Care	223	177	79%	23	10%	23	10%	200	90%	12%
Engineering Technology	80	12	15%	9	11%	5	6%	68	85%	4%
Information Technology	116	26	22%	14	12%	19	16%	82	71%	6%
CTE, No Course Record	91	41	45%	18	20%	7	8%	73	80%	5%
Grand Total	**1919**	**864**	**45%**	**267**	**14%**	**158**	**8%**	**1599**	**83%**	**100%**

As shown in Table 2, females make up the vast majority of the Human Services (86%) and Health Care (79%) Career Clusters. Females make up a very small percentage of the Transportation (8%), Construction (12%), Engineering (15%), and Information Technology (22%) clusters. Students with an IEP make up an especially high percentage (25%) of students in the Transportation Career Cluster. The percentage of ELL students in the Information Technology Career Cluster (16%) is nearly twice that of the general CTE population (8%), and there are nearly no ELL students (1%) in the Agriculture Career Cluster. Black and Latino students make up the vast majority of students (99%) in the Human Services Career Cluster, and a much smaller percentage of the Information Technology (71%) and Business and Finance (75%) Career Clusters.

In further exploring the characteristics of the cohort, 8th grade performance was considered based on results from the Pennsylvania System of School Assessments (PSSA), the state's standardized testing program for grades 3-8. Table 3 shows the descriptive breakdown of 8th grade PSSA scores in Reading and Math among CTE and non-CTE students in the cohort.

Table 3. 8th Grade PSSA Proficiency Levels for CTE and non-CTE Students

Indicator	Proficiency Level	Cohort		Non-CTE		CTE	
8th Grade PSSA Reading+^	Below Basic	26%	44%	27%	44%	21%	43%
	Basic	18%		17%		22%	
	Proficient	22%	56%	21%	56%	29%	57%
	Advanced	34%		35%		28%	
8th Grade PSSA Math+^	Below Basic	18%	33%	18%	33%	15%	31%
	Basic	15%		15%		16%	
	Proficient	31%	67%	30%	67%	36%	69%
	Advanced	37%		37%		33%	

+ Percentages include only students for whom 8th grade PSSA data are available.
^ The 2009-2010 school year was characterized by particularly high PSSA scores.

A Mann-Whitney U test was run to determine if there were significant differences in 8th grade PSSA scores between CTE students and non-CTE students. Median 8th grade PSSA Reading score was not statistically significant between CTE and non-CTE students (*U=7,131,883, z=-1.743, p=.081).* Median 8th grade PSSA Math score was also not statistically significant between CTE and non-CTE students, (*U=7,132,222, z=-.742, p=.458).* The results suggest that positive outcomes for CTE students were not likely to be the result of academically-higher achieving students self-selecting into CTE programs. These results should be interpreted with caution, however, as they are based on only one year's worth of PSSA scores.[11]

To further explore the general profile of students who enter CTE programs, a Mann-Whitney U test was run to determine if there were significant differences in 2009-2010 8th grade Average Daily Attendance (ADA) between CTE and non-CTE students. The results indicated that even before enrolling in a CTE program, ADA was significantly higher for CTE students than for non-CTE

[11] Further research is needed to determine the characteristics of students who chose and persist in CTE programs.

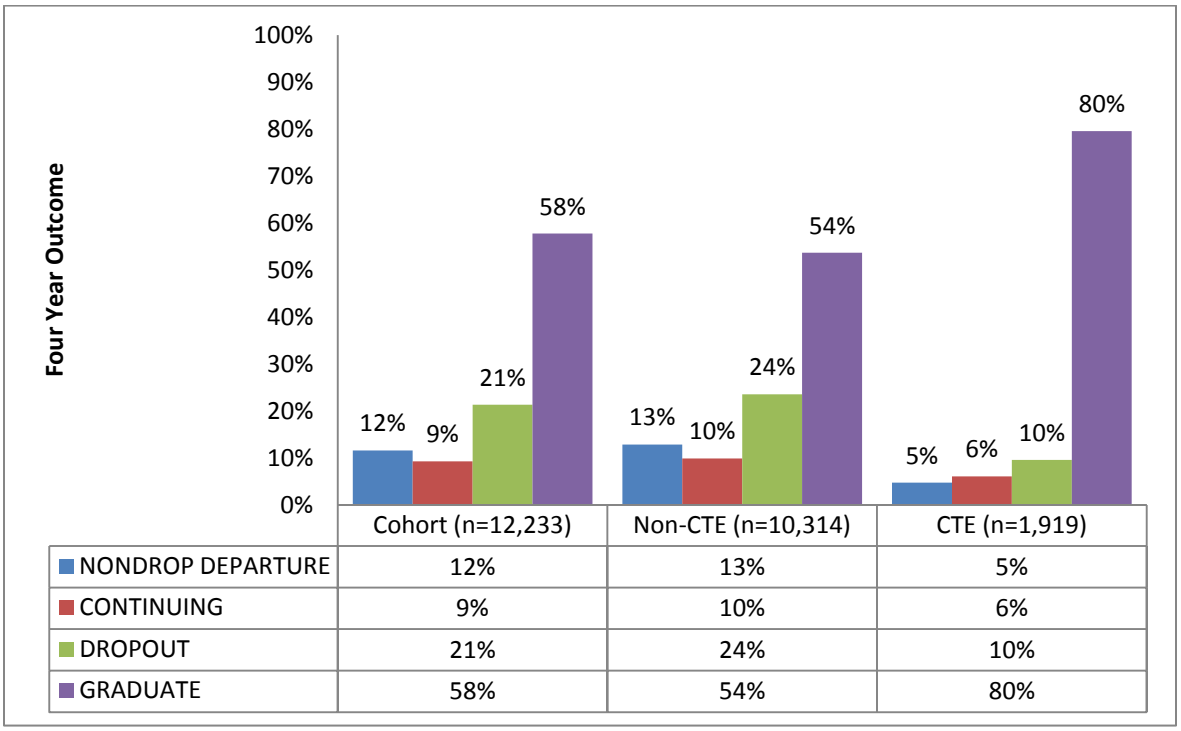
(*U=7,828,309, z=9.77, p<.001).* Median ADA was .98 for CTE students compared to .94 for non-CTE students.

These data suggest that CTE programs tend to enroll neither the lowest nor the highest achieving students (based on 8th grade test data), but students who fall somewhere in between. Viewed in combination with 8th grade attendance data, the "typical" CTE student appears to be a student who is academically average, but with a better than average attendance record. Based on these findings, it may be possible that some of the success of CTE students could be attributed to existing patterns or characteristics that encourage and enable higher attendance, such as self regulation.

Four Year Outcomes

Four year outcomes were examined for CTE students, non-CTE students, and the cohort overall. At the end of four years, students could have a) graduated; b) dropped out of school; c) continued in school beyond the fourth year; or d) previously transferred out of the District (referred to as "non-drop departure"), such that their ultimate fourth year outcome could not be determined. Four year outcomes for the cohort are shown in Figure 4.

Figure 4. Four Year Outcomes for 2010-2011 9th Grade Cohort, CTE and Non-CTE



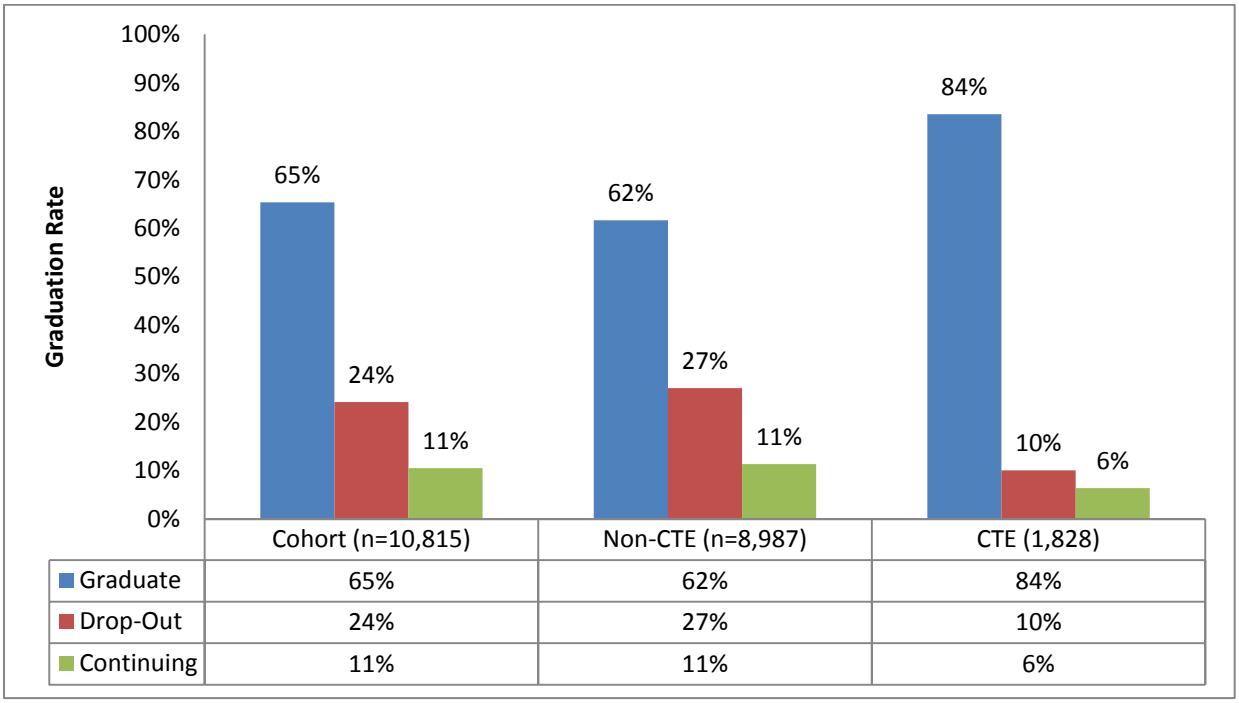
	Cohort (n=12,233)	Non-CTE (n=10,314)	CTE (n=1,919)
NONDROP DEPARTURE	12%	13%	5%
CONTINUING	9%	10%	6%
DROPOUT	21%	24%	10%
GRADUATE	58%	54%	80%

Of the original students in the cohort, 12% had left the District by transferring to a school outside of SDP. Between CTE and non-CTE students in the original cohort, 13% of non-CTE students had transferred out compared to only 5% of CTE students. This may suggest that CTE programs are deterring students and families from seeking other educational opportunities outside of the District.

Graduation Rates

When calculating the four-year cohort graduation rate, the District removes students who transferred out of a District school to another local education agency (LEA), above classified as "non-drop departure" students. Mirroring this methodology, the graduation rate was calculated for the overall cohort, the CTE cohort, and the non-CTE cohort. Overall, the District graduated 65% of its 2010-2011 first time 9th grade cohort students, 84% of its CTE students, and 62% of its non-CTE students. CTE students dropped out of school at nearly one-third of the rate of non-CTE students. These results are shown in Figure 5.

Figure 5. Graduation Rates for 2010-2011 9th Grade Cohort, CTE and Non-CTE

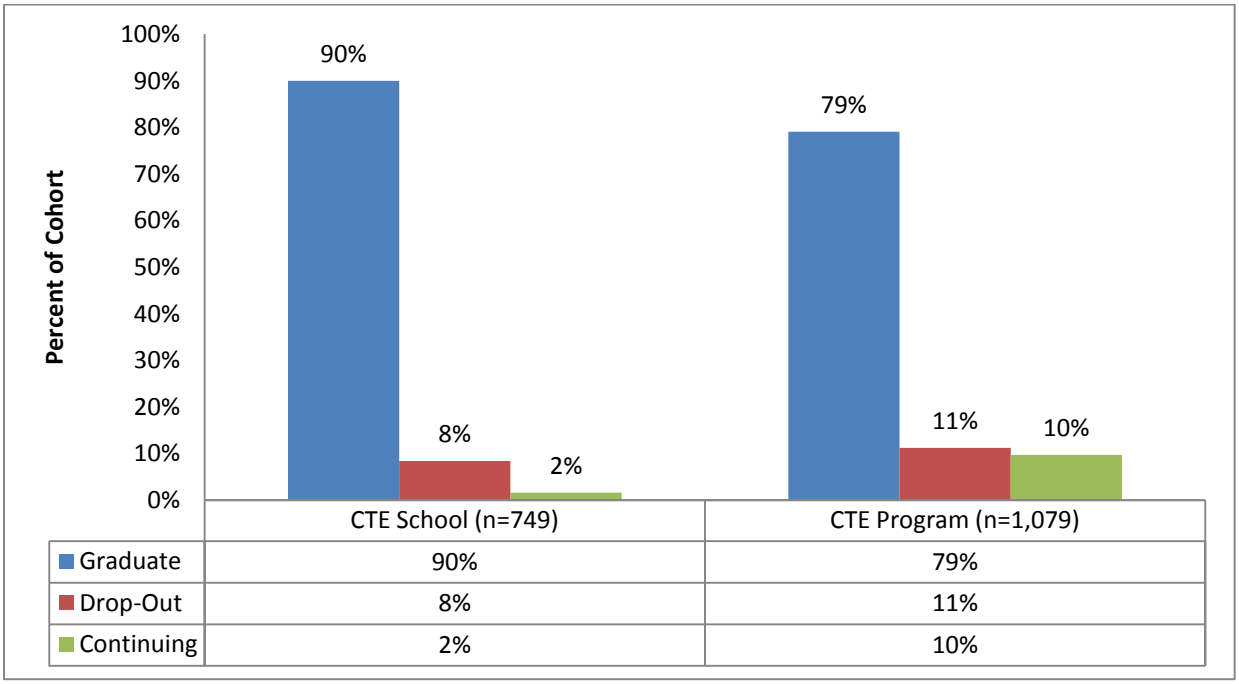


	Cohort (n=10,815)	Non-CTE (n=8,987)	CTE (1,828)
Graduate	65%	62%	84%
Drop-Out	24%	27%	10%
Continuing	11%	11%	6%

A chi-square test for association was conducted between CTE participation and likelihood of graduating on time within four years. There was a statistically significant association between CTE participation and on-time graduation ($\varphi = 0.172$, $p = .000$).

Figure 6 shows graduation rates broken out by students who attended an all-CTE school and students who attended a CTE program. Of the students who attended one of the five CTE schools, 90% graduated on time (within four years), compared with 78% of students in CTE programs. While the dropout rates for these two student groups are not dramatically different, there is considerable variance in the percentage of 'continuing' students, or those who remain in high school beyond four years. In CTE schools, 2% of students continue beyond the fourth year of high school, compared with 10% of students in CTE programs.

Figure 6. Graduation Rates for 2010-2011 9th Grade Cohort, CTE School and CTE Program



Students were further grouped based on their trajectory through a CTE program, and classified as follows:

- **On-Track CTE -** Student enrolled in a CTE course in SYs 2012-2013 **and** 2013-2014;
- **Drop CTE -** Student enrolled in CTE course in SY 2012-2013, but **not** 2013-2014;
- **Late-Start CTE** - Student enrolled in CTE course in SY 2013-2014, but **not** 2012-2013;
- **Non-Start CTE** - Student not enrolled in CTE course in either SY 2012-2013 or 2013-2014, but last school of record was an all-CTE School.

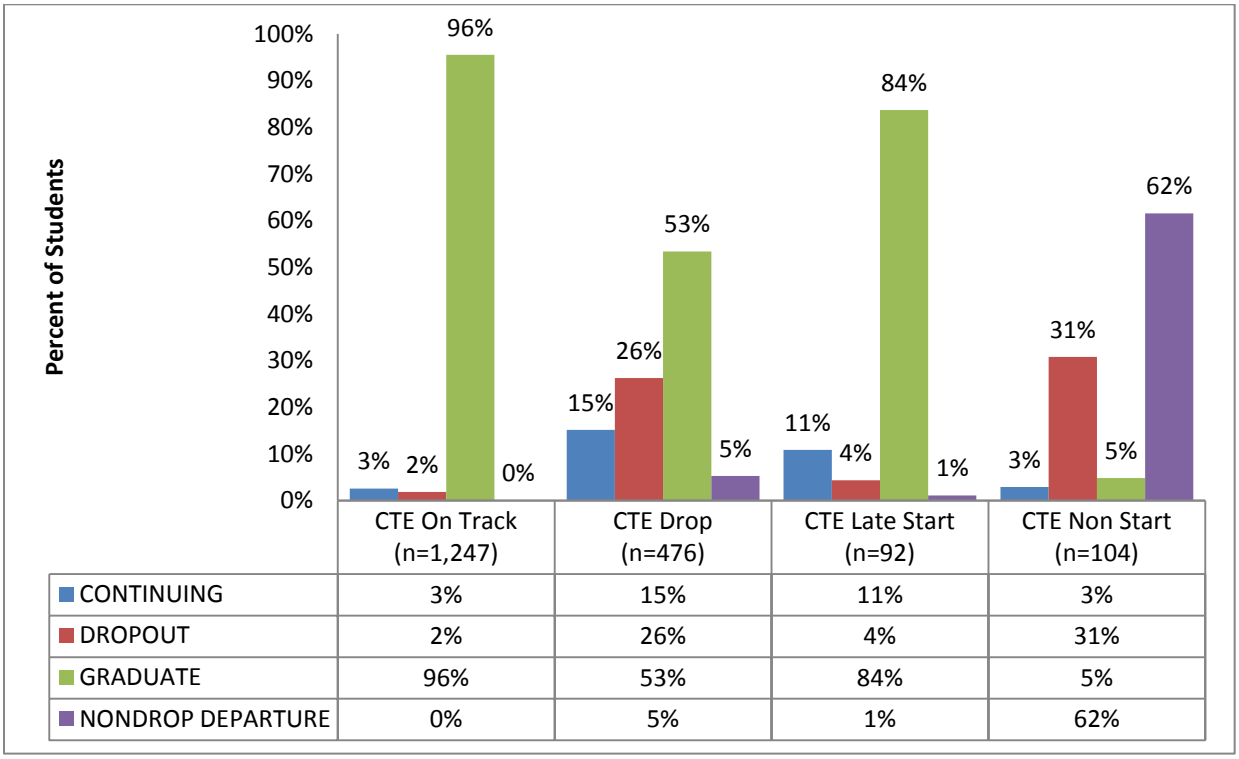
As shown in Table 4, the majority of CTE students were On-Track (65%), followed by Drop students, who discontinued their CTE program (25%), and the remaining 10% of students were either Late Start (5%) or Non-Start (5%).

Table 4. Breakdown of CTE students in cohort by type

CTE Student Type	n	% of CTE Students
CTE On-Track	1,247	65%
CTE Drop	476	25%
CTE Late-Start	92	5%
CTE Non-Start	104	5%
Total CTE Students	**1,919**	**100%**

Figure 7 shows the graduation outcomes by CTE student type, as classified above. These data demonstrate that most students who are designated as a CTE Non-Start student attended an all CTE school as their last school of record, but dropped out (31%) or transferred out (62%) prior to enrolling in any CTE courses.

Figure 7. Graduation Rates for 2010-2011 9th Grade Cohort, CTE School and CTE Program



	CTE On Track (n=1,247)	CTE Drop (n=476)	CTE Late Start (n=92)	CTE Non Start (n=104)
CONTINUING	3%	15%	11%	3%
DROPOUT	2%	26%	4%	31%
GRADUATE	96%	53%	84%	5%
NONDROP DEPARTURE	0%	5%	1%	62%

Table 5 shows graduate, dropout, continuing, and transfer rates for CTE and non-CTE students, by school. In 23 of the 24 schools in Table 5, CTE students graduated at a higher rate than non-CTE students within the same school. On average across these schools, the graduation rate for CTE students was 19 percentage points higher than the graduation rate for non-CTE students at the same school. Based on literature that indicates lower-performing students may experience academic gains by being in class with higher performing students (Gorman, 2014; Hanushek, Kain, Markman, & Rivkin, 2003; Burke & Sass, 2008), the presence of these higher performing CTE students in general education classes may create academic benefits for other students within the neighborhood school. Further research on this possible influence in District schools is needed.

Table 5. Four Year Outcomes for 2010-2011 9th Grade Cohort, by School+

School Name	Student Counts			Non-CTE Student Outcomes*				CTE Student Outcomes*			
	CTE	Non-CTE	Total	% Graduated	% Dropped Out	% Continuing	% Non-Drop Departure	% Graduated	% Dropped Out	% Continuing	% Non-Drop Departure
MASTBAUM, JULES E. HIGH SCHOOL	217	0	217	n/a	n/a	n/a	n/a	88%	12%	0%	7%
SWENSON ARTS & TECHNOLOGY H.S.	182	0	182	n/a	n/a	n/a	n/a	93%	4%	3%	10%
DOBBINS, MURRELL HIGH SCHOOL	169	0	169	n/a	n/a	n/a	n/a	87%	12%	1%	12%
EDISON, THOMAS A. HIGH SCHOOL	155	201	356	26%	60%	14%	24%	81%	15%	4%	1%
SOUTH PHILADELPHIA HIGH SCHOOL	149	161	310	48%	37%	15%	16%	82%	14%	5%	1%
SAUL, WALTER B. HIGH SCHOOL	137	0	137	n/a	n/a	n/a	n/a	97%	2%	1%	7%
RANDOLPH TECH HIGH SCHOOL	117	0	117	n/a	n/a	n/a	n/a	86%	9%	5%	7%
NORTHEAST HIGH SCHOOL	80	674	754	74%	21%	6%	16%	88%	4%	8%	3%
KING, MARTIN LUTHER HIGH SCH.	67	243	310	50%	35%	15%	19%	70%	20%	11%	1%
ROXBOROUGH HIGH SCHOOL	64	111	175	65%	24%	10%	23%	95%	3%	2%	2%
LINCOLN,ABRAHAM HIGH SCHOOL	61	423	484	55%	35%	10%	21%	97%	3%	0%	3%
JOHN BARTRAM HIGH SCHOOL	59	191	250	66%	29%	4%	14%	91%	5%	4%	3%
WASHINGTON, GEORGE HIGH SCHOOL	54	415	469	74%	20%	6%	21%	89%	7%	4%	0%
WEST PHILADELPHIA HIGH SCHOOL	36	107	143	61%	38%	1%	19%	88%	9%	3%	6%
CREATIVE AND PERFORMING ARTS	35	149	184	90%	8%	2%	9%	97%	3%	0%	0%
PENN TREATY HIGH SCHOOL	32	18	50	76%	18%	6%	6%	81%	9%	9%	0%
FELS, SAMUEL SR. HIGH	24	311	335	75%	19%	6%	20%	83%	17%	0%	0%
OVERBROOK HIGH SCHOOL	23	253	276	54%	38%	9%	22%	73%	14%	14%	4%
KENSINGTON CAPA	19	104	123	75%	18%	7%	31%	100%	0%	0%	0%
H.S. OF ENGINEERING & SCIENCE	16	171	187	98%	2%	0%	11%	94%	6%	0%	0%
FRANKFORD HIGH SCHOOL	14	401	415	55%	30%	15%	17%	83%	0%	17%	14%
ROBESON - HUMAN SERV HS	14	45	59	91%	9%	0%	4%	93%	7%	0%	0%
FURNESS, HORACE HIGH SCHOOL	13	135	148	83%	14%	4%	24%	85%	15%	0%	0%
KENSINGTON HEALTH SCIENCES	11	71	82	70%	21%	9%	21%	73%	18%	9%	0%

+Only includes schools with more than 10 CTE students in the cohort.

*The total of % Graduated, % Dropped Out, and % Continuing will add up to 100%, as these are calculated as a percentage of the number of students *excluding* non-drop departures. The % Non-Drop Departure was calculated as a percentage of all students, prior to removing these students from the denominator.

Achievement Gap

Of the students in the overall cohort (n=12,233), 59% were African American, 18% were Hispanic/Latino, 8% were Asian, 14% were White, and 1% were Multi Racial/Other. Of that group, Black/African American and Hispanic/Latino students graduated at a disproportionately lower rate (62%) than White and Asian students, who graduated at a disproportionately higher rate (86%). Even though 18% of the cohort was Hispanic/Latino, only 15% of its graduates were Hispanic/Latino, and even though only 8% of the Cohort was Asian, 11% of the cohort's graduates were Asian. This demonstrates a substantial achievement gap within the overall cohort.

Comparatively, the graduation rate for African American and Latino students in CTE programs was 83%, and the graduation rate for White and Asian students in CTE programs was 86% - a 3 percentage point gap, compared to 13 percentage points for the cohort and 16 percentage points for non-CTE students only. Graduation rates for the cohort are shown in Table 6.

Table 6. Graduation Achievement Gap for 2010-2011 9th Grade Cohort, Non-CTE and CTE

Ethnicity	Graduation Rate					
	Cohort		Non-CTE		CTE	
African American	64%	62%	60%	58%	83%	83%
Latino	58%		51%		84%	
White	69%	75%	67%	74%	87%	86%
Asian	84%		84%		85%	

Additionally, the race/ethnicity distribution of those who graduated from CTE programs perfectly mirrors the race/ethnicity distribution of the overall CTE population. For example, as shown in Table 7, the CTE population is made up 20% of Hispanic/Latino students, and Hispanic/Latino students account for 20% of its graduates. CTE programs are graduating students proportionately, regardless of ethnicity.

Table 7. Ethnicity Distribution of Overall 2010-2011 9th Grade Cohort and CTE Graduates

Ethnicity	% of Cohort Population (n=12,233)	Gap	% of Cohort Graduates (n=7,066)	% of CTE Population (n=1,919)	Gap	% of CTE Graduates (n=1,527)
Black/African American	59%	-1	58%	63%	0	63%
Hispanic/Latino	18%	-3	15%	20%	0	20%
Asian	8%	+3	11%	5%	0	5%
White	14%	0	14%	11%	0	11%
Multi Racial/Other	1%	0	1%	1%	0	1%
Total	**100%**	-	**100%**	**100%**	-	**100%**

Academic Experience and Tenacity

A District-wide Student Impact Survey was administered to all students in Spring 2014. Of the overall cohort studied for this report, 293 students responded to the survey, including 96 CTE students and 197 non-CTE students. The survey asked about students' perceptions of various aspects of their educational experience.

A Mann-Whitney U test was run to determine if there were differences in survey responses between CTE and non-CTE students. Of 48 survey questions, there were nine for which responses were significantly more favorable for CTE than non-CTE students. Results are shown in Table 8. CTE student responses were favorable on an additional 20 items, but the differences were not significant.

CTE students responded significantly more favorably in three areas of academic experience quality. They were more likely than non-CTE students to respond that teachers explain information in a way that they understand, that they are learning what they need to be successful in life, and that they learn interesting things in their classes.

CTE students responded significantly more favorably in six areas related to academic tenacity, including sub-constructs related to perceived value of education, grit/effort, self-regulation, and goal orientation. CTE students were more likely than non-CTE students to respond that learning a lot in school will help them to have a good life (value of education), that they finish whatever they start (grit/effort), that they have been shown how to study for tests, manage their time and study harder after a poor test performance (self-regulation), and that when in school, they focus on performing better than their classmates (goal orientation). More research is needed into these non-cognitive factors and how they influence selection into, and endurance in, CTE programs.

Table 8. District-wide Survey Responses compared between CTE and non-CTE Students.

	Survey Question	Non-CTE		CTE		Sig.
		N	Mean	N	Mean	
Quality of Academic Experience	My teachers have high expectations for me in school.	186	3.32	89	3.29	.526
	My teachers know a lot about the subjects they teach.	172	3.19	88	3.23	.336
	My teachers treat me with respect.	172	3.23	87	3.26	.430
	My teachers care about my success.	162	3.19	83	3.21	.425
	My teachers are willing to provide me with extra help if I need it.	169	3.28	82	3.31	.483
	My teachers explain information in a way I understand.	170	3.00	82	3.06	.048*
	I am learning what I need to be successful in life.	160	2.98	75	3.11	.000*
	My school gives me work that is neither too easy nor too hard.	155	2.95	78	2.98	.425
	My school meets my learning needs.	158	2.82	77	2.87	.250
	I learn interesting things in my classes.	160	2.89	80	3.00	.001*
	I am happy with the education I am getting at my school	157	2.78	74	2.85	.215
Academic Tenacity	I have to work hard to be successful.	195	3.63	95	3.63	.972
	My parents/guardians have high expectations for me in school.	190	3.71	95	3.67	.521
	I have high expectations for myself in school.	189	3.56	95	3.57	.550
	Learning a lot in school will help me have a good life.	192	3.26	94	3.32	.041*
	Teachers/Staff encourage me to work hard.	157	3.18	76	3.22	.229
	My parents encourage me to work hard.	156	3.53	80	3.56	.237
	I am a hard worker.	156	3.49	78	3.53	.332
	I finish whatever I start.	156	3.32	80	3.41	.018*
	I stay focused on my long-term goals.	157	3.52	79	3.54	.522
	I have been shown how to study for tests.	150	2.65	75	2.80	.000*
	I have been taught how to manage my time.	144	2.71	73	2.84	.001*
	I set aside time outside of school to do my homework and study	148	3.02	73	2.97	.352
	If I don't understand something I have read, I will go back and reread it.	150	3.38	78	3.41	.367
	If I don't know the answer to a question in school, I work to figure it out.	151	3.28	76	3.32	.259
	If I don't do well on a test, I study harder next time.	148	2.99	75	3.07	.021*
	If my schoolwork is challenging, I give up. (R)	142	1.79	75	1.82	.740
	When in school, I focus on learning as much as I can.	138	3.26	72	3.30	.319
	When in school, I focus on performing better than my classmates.	132	2.86	72	2.97	.020*
	When in school, I focus on not looking dumb in class. (R)	129	2.78	69	2.86	.124
	I believe I can learn whatever is taught in my classes.	136	3.36	72	3.34	.689
	I am confident I can do an excellent job on the assignments and tests in my classes.	138	3.29	73	3.33	.255
	I can't change how smart I am. (R)	128	2.43	68	2.49	.255
	My work in school makes me think about who I am and what I believe in.	131	2.92	66	2.98	.196
Safety of the Learning Environment	I feel welcome in my school.	119	3.22	72	3.22	.906
	I have good friends at my school.	114	3.45	72	3.25	.109
	When I am in school, I feel like I belong.	116	3.14	62	3.11	.908
	I am treated with respect by other students.	118	3.25	67	3.07	.159
	There are opportunities for me to talk with teachers/staff about problems.	115	3.18	68	3.25	.835
	There is at least one adult at school that I trust.	119	3.24	71	3.52	.106
	I feel safe at school.	115	3.23	69	3.10	.362
	I feel safe going to and from school.	113	3.12	70	3.23	.406
	I am bullied at school. (R)	118	1.58	69	1.42	.179
	I am treated poorly at school because of my race or background. (R)	118	1.53	71	1.52	.800
	I am treated poorly at school because I am learning to speak English. (R)	113	1.40	67	1.49	.506
	I am treated poorly at school because I am dealing with a disability. (R)	110	1.41	67	1.54	.289
	My school is clean.	118	2.29	64	2.11	.229
	The school building is in good condition.	114	2.41	67	2.46	.749

* Difference is significant at p<.05

Note. (R)=reverse scored items. Items 1a to 48h were assessed on a 4-point scale: 1, Strongly Disagree; 2, Disagree; 3, Agree; 4, Strongly Agree.

Multivariate Analyses

Methodology

In order to further explore the extent to which differences in CTE and non-CTE graduation rates can be attributed to prior student characteristics, two logistic regression analyses were performed. The first looked at students enrolled in CTE programs nested within neighborhood, citywide, or special admit schools, and the second looked at CTE students who attended one of the five all-CTE schools. Since most CTE students have, by definition, persisted in school until at least the 10th grade, students who dropped out of school prior to 10th grade were excluded from the sample in order to make the groups more comparable. The list of independent variables used in the final regression models is outlined in Table 9.

Table 9. Predictor Variables, On-Time Graduation.

Predictor Variable	Definition	Comments
Student Demographics		
Free from Tape	Most economically disadvantaged category	Disability and English Language Learner status were not significant in any models; therefore they are not included in the final models
URM (Under Represented Minority)	Not identifying as White or Asian	
Male		
8th Grade Proficiency		
Adv/Prof in Math	Scored 'Advanced' or 'Proficient' on 8th Grade PSSA Math exam	Including this variable decreased available sample significantly; including PSSA Reading would have decreased the sample even further and did not impact the model
9th Grade Indicators		
ADA	Average Daily Attendance	Research points to attendance, grades, and behavior as key predictors of graduation; used 9th grade because many students were missing 8th grade data
D or F in Math or Reading	Received a D or F as their final grade in Math or Reading course	
1+ suspension	1 or more out-of-school suspensions	
CTE status		
CTE Student	Enrolled in a CTE program or CTE comprehensive school	Analyzed in separate models because in one, 'CTE student' is a student-level variable within a school, and in the other, it is a school level variable

Findings

Both students attending full comprehensive CTE schools and students enrolled in CTE programs are more likely to than non-CTE students to graduate on-time, holding constant a number of student characteristics and achievement indicators.

Table 10 looks at CTE students enrolled in CTE programs at city, neighborhood, and special admit schools, as compared to non-CTE students within these schools. Holding all other variables in the model constant, CTE students were 2.092 times more likely to graduate on-time than non-CTE students. The final model correctly predicted the graduation outcome of 76.6% of students, compared to 65.2% using no predictor variables. The pseudo R- square value, which can be cautiously interpreted as the amount of outcome variance explained in the model, is .362, or 36.2%.

CTE students who attended one of the five all-CTE schools were evaluated in a separate model, as seen in Table 11. These CTE students were 2.36 times more likely to graduate on-time than non-CTE students in any kind of school. The final model correctly predicted the graduation outcome of 76.3% of students, compared to 66.8 % using no predictor variables. The pseudo R-square value, which can be cautiously interpreted as the amount of outcome variance explained in the model, is .371, or 37.1%.

Further analyses could be conducted using nested modeling techniques (i.e., HLM), which would make it more feasible to include both types of CTE students in the same model, and to account for school-level effects. Nevertheless, these findings lend strong support to the conclusion that both types of CTE students graduated at higher rates, even when accounting for pre-existing characteristics and prior achievement.

Table 10. Predicting On-Time Graduation: CTE vs. non-CTE Students

(CTE Programs within Neighborhood, Citywide, or Special Admit Schools)

		Odds Ratios : Exp (B)			
	% of students	Model I	Model II	Model III	Final Model
Student Demographics					
Free from Tape	44.5%	.497**	.590**	.828*	.814*
URM	76.1%	.626**	.985	1.322*	1.272*
Male	50.7%	.572**	.592**	.578**	.567**
8th Grade Proficiency					
Adv/Prof in Math	48.0%		4.237**	2.059**	2.111**
9th Grade indicators					
ADA (mean)	87.71			1.057**	1.055**
D or F in Math or Reading	50.5%			.374**	.375**
1+ suspension	22.3%			.658**	.661**
CTE Status					
CTE student	12.1%				2.092**
N= 5,794					
Pseudo R-square		.075	.188	.352	.362
% correctly predicted		66.8	69.3	76.3	76.6

* p<.01 **p<.001

Table 11. Predicting On-Time Graduation: CTE vs. non-CTE Students

(Students at all-CTE Schools vs. all non-CTE Students)

		Odds Ratios : Exp (B)			
	% of students	Model I	Model II	Model III	Final Model
Student Demographics					
Free from Tape	45.1%	.511**	.596**	.849	.838*
URM	77.9%	.593**	.955	1.245	1.124
Male	50.2%	.553**	.579**	.560**	.554**
8th Grade Proficiency					
Adv/Prof in Math	45.8%		4.290**	2.076**	2.143**
9th Grade Indicators					
ADA (mean)	87.47			1.061**	1.058**
D or F in Math or Reading	50.9%			.390**	.397**
1+ suspension	22.4%			.694**	.717**
CTE status					
CTE student	8.2%				2.360**
N= 6,205					
Pseudo R-square		.077	.191	.364	.371
% correctly predicted		66.0	68.3	76.2	76.3

* p<.01 **p<.001

Conclusions and Recommendations

CTE's strategies of engagement through rigorous and relevant coursework, positive relationships and clear pathways for education and careers can make a difference for urban students, who often struggle against economic and social disadvantages (Association for Career and Technical Education, 2012). The following takeaways are offered based on findings from this report:

1. **There is evidence that CTE programs are contributing to higher graduation rates for CTE students.** These contributions do not appear to be solely attributable to academically higher achieving students being tracked or phased into CTE programs. Overall, the graduation rate for CTE students was 22 percentage points higher than for non-CTE students. Among schools with CTE programs, the graduation rate for CTE students within the school was 19 percentage points higher, on average, than for non-CTE students within the same school. Furthermore, regression analyses show that CTE students in both CTE programs and all-CTE schools are more than twice as likely to graduate on-time than their non-CTE peers, holding constant a number of student characteristics.

2. **There is evidence that CTE programs may contribute to students remaining in District-run schools, rather than transferring to charter or non-public schools, or moving out of the District.** In the cohort studied, CTE students moved from the District at nearly one third of the rate of non-CTE students.

3. **The CTE cohort has a significantly narrower achievement gap than the non-CTE cohort.** Among the CTE student group, the most historically disadvantaged groups (African American and Latinos) are graduating at a rate on par with their historically high-achieving peers (White and Asian students).

4. **There is considerable variation in the demographic makeup of each CTE Career Cluster.** Specifically, female students – although they make up 45% of the CTE population – make up only 15% of the Engineering Technology cluster and 22% of the Information Technology cluster. Similarly, although Black and Latino students make up 83% of CTE students, they make up only 75% of students in the Business and Finance cluster.

5. **Data quality remains critical to accurate and meaningful tracking of CTE students.** An ongoing cross-functional effort has improved the identification and flagging of CTE courses and students in the District's data systems, as well as the consistency with which CTE students are rostered at the school level. The CTE office must remain vigilant in reducing variability in the schools' interpretation and use of CTE course codes and trajectories.

Moving forward, the results of this analysis will be combined with observational and programmatic information to help identify best practices in CTE that are occurring within the District, and shed light on areas for potential improvement in reaching the goals of increased access, quality and equity of CTE programs.

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