

Challenging Traditional Expectations

How New York City's CTE High Schools Are Helping Students Graduate

A Report by the Community Service Society
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Executive Summary

Career and Technical Education (CTE) is a small but growing part of our school system. CTE high schools offer students a chance to explore careers and learn skills as they complete the traditional requirements necessary for graduation. CTE has gained significant attention in New York City, having been the focus of a mayoral commission in 2008, a major report by the new mayor (then the Public Advocate) in 2012, and a visit from the President of the United States in 2013. Each of these entities has called for increased investment and improvements to CTE.

This study conducts a quantitative analysis of student- and school-level data in an attempt to determine if and how CTE programming benefits New York City students. We find strong boosts in graduation rates for students in CTE schools compared to similar students in non-CTE schools.

Findings, In Brief

- ▶ **CTE schools serve students who, on average, enter high school less likely to graduate.** Students who enroll in CTE schools are more likely to have slightly lower 8th grade test scores, be black or Latino,¹ and be economically disadvantaged than students in non-CTE schools.
- ▶ **New York City public high school students are more likely to graduate if they attend a CTE school.** At the broadest level, students in CTE schools graduate at higher rates than similar students in non-CTE high schools, controlling for a range of other factors correlated with graduation rates, such as race/ethnicity, poverty status, 8th grade test scores, school choice, and language ability.² Within the portfolio of CTE schools, those created since 2003 show even stronger graduation outcomes—students in new CTE schools are 18 percentage points more likely to graduate than comparable students in non-CTE schools. This bodes well for the future of CTE expansion efforts, given that the characteristics of newer schools—smaller class sizes, a single industry focus, and greater alignment to employer demand—are clear and replicable. In addition, the individuals and organizations that worked to develop these schools are more likely to be available to advise and support additional school creation.
- ▶ **Black and Latino students, and males in particular, have remarkably higher graduation rates at CTE schools.** The student subgroups that traditionally have the lowest high school graduation rates see much stronger outcomes in CTE schools. The graduation rate for both black and Latino males outside of CTE schools is just 52 percent; in CTE high schools, they graduate at a rate of 63 and 66 percent, respectively. And their graduation rates in new CTE schools, even when controlling for the most important differences among students, such as their 8th grade test scores, are even higher.
- ▶ **Students with slightly below average 8th grade test scores see the strongest gains in CTE schools.** Along the distribution of student performance on 8th grade test scores, CTE participation has little relationship with graduation for students with very low or very high scores. In fact, students with the lowest 8th grade test scores are less likely to graduate in a CTE school. But those students who test just below proficiency on 8th grade exams—a critical group, given that they are the largest part of the distribution—see an important boost in graduation rates at CTE schools. Black and Latino males with 8th grade test scores that are slightly below average see graduation rates that are up to 25 percentage points higher in new CTE schools compared to similar students in non-CTE schools.

- ▶ **Students in CTE schools have lower rates of college readiness, according to NYCDOE metrics, than non-CTE students.** Despite graduating at higher rates, students in CTE schools are less likely to meet measures of college readiness used by the New York City Department of Education (NYCDOE).³ Twenty-three percent of students in non-CTE schools meet the college readiness standard, compared to 18 percent of CTE students. Exceptions to this are Latino males, who show greater likeliness to be college ready if they attend CTE schools, and black males, who show no difference in college readiness in CTE and non-CTE schools. Nevertheless, college readiness rates at CTE schools, and across all New York City public high schools, are extremely low.
- ▶ **Individual CTE schools compare very favorably to schools with similar student populations.** When using NYCDOE peer index scores to compare schools with similar student populations, we see that many CTE schools—old and new—outperform comparison schools in graduation rate, and in some cases, college enrollment. Very few CTE schools are notably below the average graduation rate for their peer group.
- ▶ **CTE schools underserve Queens students and English Language Learners.** Despite the fact that a relatively higher share of Queens public high school students express a preference to attend CTE schools, they face the greatest chance of being turned away from CTE schools. We also find that CTE schools serve a surprisingly low share of English Language Learners, across both Latino and Asian students, compared to non-CTE schools (6 vs. 12 percent).
- ▶ **There are too few CTE schools.** The existing number of CTE schools is not meeting current student demand for CTE. Too many students—over 800 each year—are not enrolled in CTE schools despite ranking one as the top choice on their high school application. The graduation results for students who ranked a CTE school as their top choice but were enrolled in a non-CTE school are extremely low, and raise questions about how these students might have fared had they enrolled in their top choice.

But perhaps more importantly, CTE schools are producing strong results with a sizable segment of the student population—those just below proficiency standards when they finish middle school. Given that this group makes up the largest share of the student distribution, policies that have a major impact on them are especially appealing.

Recommendations

- ▶ **CTE schools should be an increasing share of new school development.** The graduation results of CTE schools, particularly among black and Latino males, speak for themselves. The NYCDOE should seek to aggressively expand the CTE portfolio, using models similar to those developed since 2003: smaller schools, with a single industry focus, aligned to projected employer demand. One clear area for expansion is Queens, which has the highest share of students who seek to attend a CTE school, despite there being relatively few CTE schools to choose from in the borough. CTE schools should also seek to enroll more English Language Learners, who are very underrepresented in CTE schools.

As part of expansion efforts, more data should be collected and analyzed on students in CTE schools. With 20 CTE schools opening from 2009 to 2013, the NYCDOE will have an opportunity to track several large cohorts of CTE students and evaluate their high school careers and outcomes. Additional qualitative research should be done to figure out what works in CTE schools. And data collection should include employment outcomes, in addition to rates of high school completion and postsecondary enrollment.

- ▶ **New CTE schools should target students just below the averages for proficiency in English Language Arts and Math.** Our analysis show that the strongest gains in graduation from CTE schools accrue to those students just below the mean in middle school test scores. The NYCDOE should seek to target this population directly as it develops and implements admission procedures at its new CTE schools. Students with very low and very high middle school test scores see, on average, little or no graduation gains in CTE schools. Whereas CTE was once thought of as programming for the least proficient students, our data show that this is not the case today; students with the lowest 8th grade test scores perform worse in CTE than non-CTE high schools.

- ▶ **CTE schools need to include a greater focus on college readiness.** Despite higher graduation results, CTE students are, on average, less likely to meet the NYCDOE's metrics for college readiness. The promise that CTE schools show in assisting greater shares of students to meet the bar of graduation is not enough if these students are not equipped to excel at the next level. CTE schools should work to ensure that students can meet these benchmarks if they hope to shed the reputation as an alternative to college preparation programs. This is particularly true in light of the fact that although CTE schools may offer the chance of employment directly after high school, a two- or four-year college degree is an increasing requirement of jobs that pay family-sustaining wages.

Introduction

What is Career and Technical Education (CTE)?

Career and Technical Education (CTE) is programming within schools that explicitly aims to provide young people with the understanding of job skills and career pathways, in an educational setting embedded in real-world relevancy. CTE, once known as vocational education, has shifted away from a focus on training in jobs requiring limited education, toward a more comprehensive integration of academic and technical abilities for middle-skill jobs and careers that typically require at least some postsecondary education. CTE reform efforts have sought to use career-oriented programming to both keep students engaged in high school by increasing the real-world relevancy of their coursework, as well as offering a clearer pathway and rationale for postsecondary education and training. The attainment of specific job skills certification may offer many

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opportunities to enter employment after high school that are not available to other students; however, the rhetoric around CTE no longer seeks to separate its students from those who might be explicitly seeking to attend college.

Fully-dedicated CTE high schools—which constitute about 5 percent of high schools, nationally—receive supplementary federal funding through the Carl D. Perkins Act, most recently reauthorized in 2006, with a renewed focus on increasing links to postsecondary education and training for careers in fields using technology and paying high wages.⁴ Federal funding is used to offer courses and equipment in professional fields, for which students can gain an industry-recognized certification.⁵

This shift in thinking about CTE has presented itself in prominent places. President Obama cited Pathways in Technology Early College High School (P-TECH) in New York City in his 2013 State of the Union address as an example of forward-thinking education reform. P-TECH students can study for up to six years and obtain an associate's degree in computer programming or electromechanical engineering in addition to their high school diploma. The school has formal partnerships with IBM and New York City College of Technology.⁶

Supporters of CTE have fought against the stigma of CTE schools as a second-class track for less proficient students. Our organization, the Community Service Society of New York (CSS), conducts a rigorous survey each year that has asked New York City residents whether they believe CTE programming should be expanded, and also whether they would send their own children to such schools. The results are compelling: 83 percent of New Yorkers said a CTE school would be a good option for their own child.⁷ More recently, CSS asked New Yorkers if they would be willing to pay more in taxes to expand and improve CTE schools: 73 percent of New Yorkers said yes.⁸

The promise of CTE: Career Academies

On a nationwide scale, CTE has demonstrated success in rigorous evaluations of the Career Academy model, a 45-year-old high school approach that combines academic and technical curricula around a career theme and forges connections with local employers to provide career development and work-based learning opportunities for students.⁹ In 2008, the results of a 15-year, longitudinal, random assignment evaluation of Career Academies showed strong employment and earnings outcomes, promising postsecondary enrollment, and positive effects on family stability.¹⁰ The high schools in the evaluation were located in large urban school districts with large percentages of low-income families, African American and Latino students, and high dropout and unemployment rates. In addition to increases in the number of months employed, hours worked per week, and hourly wages, Career Academies increased family formation and social adjustment outcomes of both young men and women. Postsecondary education credential outcomes were also slightly higher for students in Career Academies.

CTE in NYC

Currently, there are 45 fully-dedicated CTE high schools in New York City, which served 26,364 of approximately 305,000 high school students within the New York City Department of Education (NYCDOE) system in 2012. A “CTE school” is one in which it is presumed that every student is enrolled in a CTE program sequence, and therefore receives weighted funding to cover extra costs such as lab equipment. Twenty of these schools have opened since 2009, seven were opened between 2003 and 2008, and 18 are over a decade old. Differences in outcomes across old and new CTE schools are important and identified throughout the report. Generally speaking, newer CTE schools typically have smaller class sizes and a single industry focus, while older schools tend to be larger and with multiple tracks. The NYCDOE has sought to ensure that newer schools have greater commitments from industry partners and principals who are familiar with the industry. The portfolio of CTE schools is evolving rapidly—five more CTE schools are opening in 2014, while four old schools are being phased out¹¹—so now is a critical time to understand the potential impacts and limitations of CTE in New York City.

CTE schools provide core academic instruction within the context of specific career fields that include aviation, information technology, healthcare, fashion, and travel and tourism.¹² CTE programs offer applied learning experiences, exposure to career pathways, career readiness activities, and employer mentorships. In addition to fully-dedicated CTE schools, where all students participate in a CTE sequence, there are around 300 CTE programs in roughly 100 non-CTE schools. These schools also offer CTE courses to students engaging in a standard high school sequence.

In 2008, Mayor Michael Bloomberg declared career and technical education (CTE) innovation a priority and commissioned a mayoral task force to recommend how to strengthen and expand CTE opportunities and improve student outcomes.¹³ In 2012, the Office of the Public Advocate released a report that reviewed the state of CTE programming several years after the mayoral commission, and nearly ten years after Mayor Bloomberg took control of the public school system.¹⁴ The report provided a comprehensive overview of the progress that has been made in CTE, and the remaining opportunities for CTE reform efforts.

This study

The goal of this study is to examine the state of CTE in New York City through a quantitative analysis of student- and school-level data. Readers should refer to previous efforts, principally the 2012 Public Advocate’s report and the report of the Mayoral Task Force, for a deeper qualitative understanding of CTE programming in New York City. We have relied on those efforts to assist us in developing frames for our quantitative analysis.

We seek to examine several sets of questions about CTE schools in New York City:

1. Who enrolls in CTE schools?

- Are certain subgroups more or less likely to participate in CTE schools?

2. What are the outcomes of students in CTE programs?

- Are students who participate in CTE programs more or less likely to graduate than students in non-CTE programs?
- Are students in CTE programs more or less likely to be assessed as college-ready than those in non-CTE programs?

3. How do CTE schools compare to similar non-CTE schools in terms of aggregate graduation and college enrollment outcomes?

Methodology

We seek to answer these questions with a thorough analysis of student- and school-level data about New York City high school students. We are grateful to the New York City Department of Education for providing us with student-level data about high school enrollment choices, student demographics, test scores, and graduation through August 2012. The NYCDOE has added CTE schools each of the past few years; there are now 45 schools designated as full CTE high schools. Twenty of these were opened after 2009. This study examines the 25 CTE high schools that had at least one graduating class by August 2012. (For example, P-TECH, created in 2011, is not included in our analysis.)

We focus our analysis on the cohort of students that entered high school in September 2008, whose four-year graduation occurred in June or August 2012. Our dataset consists of data on 79,705 students, 6,262 of whom enrolled in CTE schools in 2008.

The chart in Appendix A lists the 25 CTE schools in our study as well as the programs offered within those schools. CTE schools, and the different programs (CTE courses of study) within them, are unique—the table offers a description of some of their differences.

Perhaps the main challenge in examining the outcomes of students in CTE schools is making appropriate comparisons. Students and schools are diverse and distinct in many ways, making it difficult to know how one student who participated in a CTE school might have fared in a different school. The ideal way to evaluate New York City’s CTE schools would be to randomly assign students who were interested in CTE to either a CTE or non-CTE school. Although this is not possible for this study, we do have data that allows us to control for some differences between students. This includes demographics such as their sex, race/ethnicity, eligibility for free or reduced lunch, and whether they are English Language Learners (ELLs). In addition, we have access to other useful data, including the results of the Math and English Language Arts (ELA) test scores in 8th grade. We also know where they ranked the school they attend in their high school application, and are able to control for a student’s desire to attend a CTE school. There are undoubtedly a range of important student-level factors that we are unable to control for; however, we can use the available data to identify some useful hypotheses about student performance in CTE schools.

There are also many school-level effects—such as school culture, class size, staff and teacher quality—that are beyond our ability to capture in this study. Schools themselves are also different in many ways, and attempting to isolate and draw conclusions about their “CTE-ness,” as this study does, is complicated and hides significant detail.

Other important limitations of our study include:

- **Grades:** Schools still collect and report grades in very different ways, preventing us from being able to make useful comparisons about student performance in terms of grades.
- **CTE “dosage”:** another of our initial goals was to expand the methods of our study to include analysis of students at schools that were not fully-dedicated CTE schools, but which offered some CTE classes to students that chose to take them. We had hoped to construct a dosage model that might allow us to examine the relationship between performance and the number of CTE courses taken by a student. However, we did not have access to sufficient and consistent data to make these comparisons usable.
- **College enrollment:** The NYDOE did not provide requested data on postsecondary enrollment data at the student level. We therefore relied on publicly available statistics about college enrollment at the school level, and were thus unable to make comparisons about college enrollment among subgroups of students.
- **Employment data:** the NYCDOE does not collect data on the employment outcomes of its students, which is particularly valuable in evaluating career-oriented schools.

Who Enters CTE Schools?

This section provides a description of the students in CTE high schools.¹⁵ These data offer both a picture of the CTE student population, as well as a context for understanding student outcomes during and after high school, as presented in the next section of this report.

Broadly, CTE schools serve students with characteristics correlated with lower graduation rates than non-CTE schools. CTE students are more likely to have lower 8th grade test scores, be black or Latino, come from low-income households, and have learning disabilities than students in non-CTE schools. On the other hand, students in CTE schools are less likely to be English Language Learners. CTE students are more likely to have selected the school they attend as their top choice for high school. And a disproportionately high share of CTE students reside in Brooklyn or Queens.

CTE students entered high school with slightly lower 8th grade Math and ELA test scores than non-CTE students

Students in CTE schools had slightly lower scores on the state-mandated examinations in Mathematics and the English Language Arts (ELA) taken during the 8th grade.¹⁶ These tests are scored on a scale from 1.00 to 4.99. Students are classified as Level 1, well below proficient, if their score is between 1.00 and 1.99; Level 2, below proficient, if their score is between 2.00 and 2.99; Level 3, proficient, if their score is between 3.00 and 3.99; and Level 4, exceeding proficiency, if their score is between 4.00 and 4.99. The average Math/ELA test score of students in our sample was 3.02.¹⁷

CHART 1: AVERAGE SCORES ON 8TH GRADE EXAMS (ON A SCALE OF 1.00 TO 4.99)

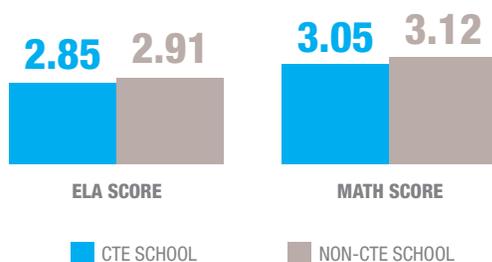
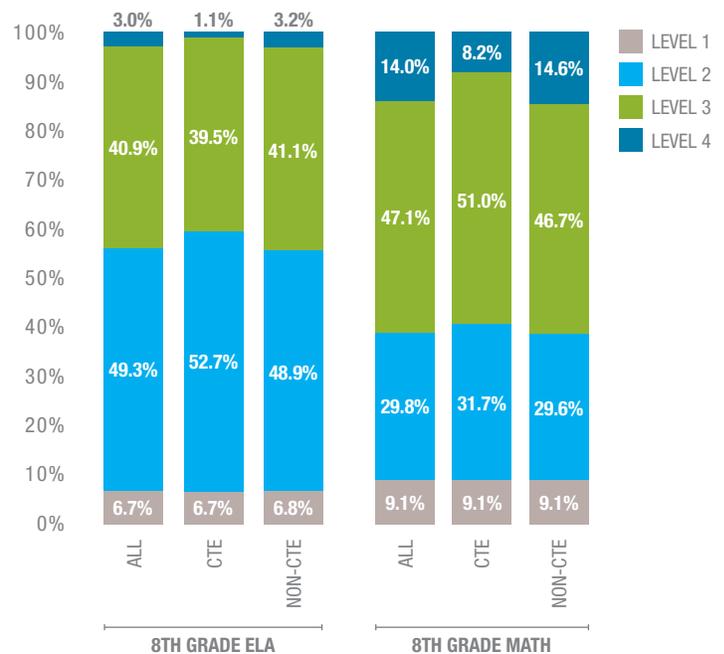


CHART 2: SHARES OF STUDENTS' SCORES FOR EACH EXAM

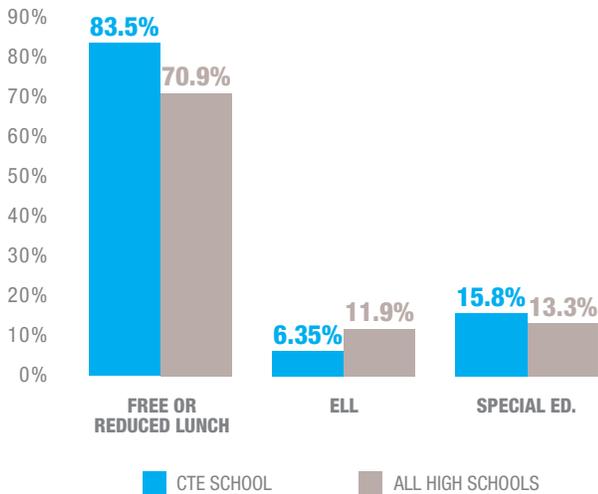
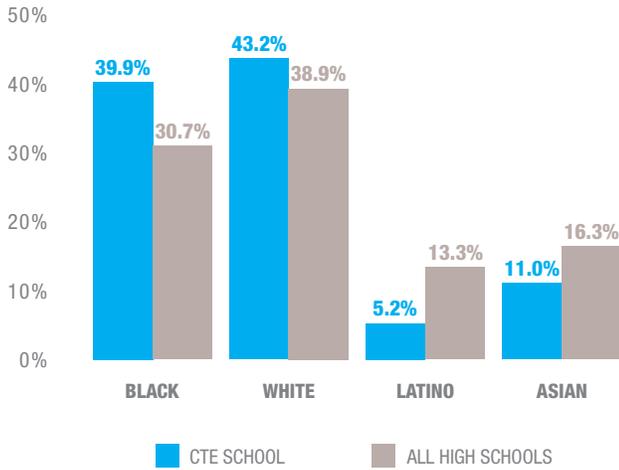


On average, students in CTE schools have 8th grade test scores that are lower—by 0.06 in ELA and 0.07 in Math—than students in non-CTE schools. Looking deeper, CTE schools attract more students at and just below the middle of the test score distribution. Similar shares of students from CTE and non-CTE schools are at the lowest level of proficiency in 8th grade, but CTE schools have far fewer students who exceed proficiency standards in 8th grade.¹⁸

CTE school students are more likely to be black or Latino

Black and Latino students are a greater share of the population of CTE schools than they are across New York City high schools. Black students, in particular, are a much greater presence at CTE schools, where they represent nearly 40 percent of the population, compared to 30.7 percent of all public high school students. Latinos are also a greater share of students (43.2 percent) at CTE schools than they are of all high school students (38.9 percent). Together, black and Latino students are 83.1 percent of CTE students, compared to 69.6 percent of all high school students in 2011–12. White and Asian high school students are much less represented at CTE schools (16.2 percent, combined) than they are across the system (29.6 percent).

CHARTS 3-4: DEMOGRAPHICS OF STUDENTS IN CTE SCHOOLS



It appears that black and Latino students consider CTE schools to be much more appealing options than whites or Asians, as the degree to which students are placed into their top choice school is generally consistent across racial groups.¹⁹ White students, in particular, seem far less interested in attending CTE schools. This is borne out by what appears to be a willingness to travel. Over half of black students who live in Queens travel to attend CTE schools in Brooklyn or Manhattan. Latinos are also more likely than whites or Asians to travel outside of their home borough to attend a CTE school.

CTE students are more likely to be low income and have learning disabilities, less likely to be English Language Learners

Students in CTE high schools are much more likely (83.5 percent) to receive free or reduced lunch—because they come from low-income households—than the overall high school population (70.9 percent). They are also more likely to have been diagnosed as eligible for special education services (15.8 percent to 13.3 percent)

Yet despite attracting more Latino students from low-income households, CTE students are far less likely to be English Language Learners (ELLs) than students in non-CTE schools. Latino and Asian students are the most likely to be English Language Learners, citywide. Yet Latinos (8 percent vs. 19 percent) and Asians (3 percent vs. 20 percent) in CTE schools are far less likely to be ELLs than students from those groups who attend other schools.

Most students enrolled in CTE schools did so intentionally, and students who seek to attend CTE have a relatively high probability of being matched to their school of choice

A major feature of the current educational system in New York City is school choice. Every year, 8th graders apply to the high schools that they wish to attend by ranking them on a list of 12 possible choices. Proponents of school choice claim that students are more likely to succeed in a school that they chose to attend, especially if the school’s focus matches their specific interests. To be able to test theories about school choice, we would hope to see that the students in CTE schools choose to be there. And our data shows this to largely be the case—in fact, students who ended up enrolling in CTE schools were more likely to have chosen that school than students who enrolled in non-CTE schools.

TABLE 1: SCHOOL CHOICE RESULTS

	CTE students	Non CTE students
1st choice	53%	48%
Top 3 choice	79%	70%
Not Top 3 choice	21%	30%

It does appear that choice is working as intended, from the perspective of getting students who want to be in career-oriented programming into those schools. The students currently in CTE schools want to be there: a majority (53 percent) of students in the 2012 NYCDOE cohort who ended up enrolling in a CTE school ranked that school as their first choice. Students who chose non-CTE schools as their first choice had a lower probability of enrolling in those schools (48 percent). Seventy-nine percent of students who enrolled in a CTE school were matched with one of their top three choices, compared to 70 percent of students who ended up in non-CTE schools. A lower share of students in CTE schools (21 percent) did not select the school as one of their top three choices compared to students in non-CTE schools (30 percent).

Students from Brooklyn, Queens, and the Bronx are more likely to attend CTE schools

As Table 2 illustrates, students from Brooklyn and Queens are overrepresented in CTE schools. Students from these boroughs select a CTE school as one of their top three choices at rates higher—particularly in the case of Queens students—than their general share of the city’s public student population. Yet even more Brooklyn students are “finalized” to (eventually enrolled in) those schools, even if the school was not one of their top three choices. The opposite is true of Queens students: despite the fact that they are generally the most interested in attending a CTE school, they are much less likely to be successful in enrolling in a CTE school.

Despite having just 15 percent of public school students, Manhattan is home to the highest percentage of CTE schools (33 percent), a figure that has increased in the last few years. And of the 20 CTE schools created since 2009, Queens, whose students show the most interest in CTE, added just two of them.

These data may be viewed as positive by those who believe that student mobility is beneficial, in that it exposes students to new areas of the city. And CTE supporters may be encouraged that higher shares of CTE students are willing to travel. But others may argue that these data call for more CTE schools in areas such as Queens.

CTE students travel to attend CTE schools—they are not simply choosing the schools close to them

Far fewer students who enrolled in CTE schools ended up attending a high school near them, as compared to students attending other schools. It appears that most students who wanted to attend a CTE school were not motivated by the school’s proximity. Just 5.7 percent of CTE students attended a school in their same zip code, compared to 14 percent of non-CTE students.

Looking even more broadly, CTE students, across the city, were more likely to travel to another borough to attend school than non-CTE students. This is particularly true of Queens students, who, likely due to the relatively few CTE opportunities in their borough, showed the greatest difference in mobility between students who attended CTE schools versus other schools.

TABLE 2: SCHOOL CHOICE RESULTS

	CTE Top 3 Choice	Finalized CTE	Citywide Students	Share of CTE Schools
Brooklyn	31.4%	37.3%	29.9%	24%
Manhattan	9.3%	8.3%	15.2%	33%
Queens	32.6%	26.1%	28.4%	16%
Staten Island	2.9%	3.4%	6.1%	2%
Bronx	23.3%	24.7%	20.7%	24%

What are the outcomes of students in CTE high schools?

This section examines the outcomes of students who attend CTE schools, with a primary focus on high school graduation and college readiness. Using cross-tabulations and regression analysis, we compared the outcomes of similar students in CTE and non-CTE schools. We control for a range of factors including school choice; race, ethnicity, and gender; and 8th grade test scores, in an attempt to isolate the relationship between attending a CTE school and students' likelihood to graduate or meet a standard of college readiness.

We find that students who attend CTE schools are more likely to graduate compared to students who attend non-CTE schools, despite the fact that students who attend CTE schools have, on average, characteristics that are associated with a lower likelihood of graduating.

Statistically significant higher graduation rates for CTE students hold when using regression analysis to control for a range of student characteristics, and graduation rates are markedly higher for students in the subset of CTE schools created since 2003. Within the student population, blacks and Latino males, and students with slightly below average 8th grade test scores, show the greatest graduation gains in CTE schools.

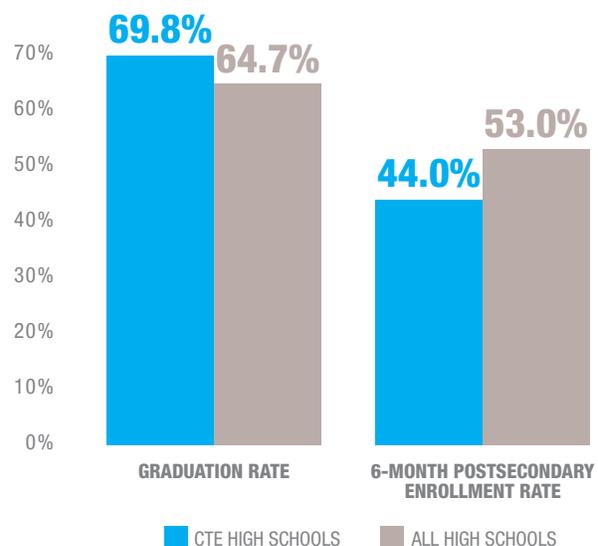
Although graduation rates are consistently higher, CTE students, on average, have lower rates of college-going and college readiness than non-CTE students. Notable exceptions to this are black and Latino males, the latter of whom have higher college readiness rates in CTE schools.

Broadly, higher graduation rates but lower college-going

Our analysis defines graduation as students who achieved a full Regents diploma²⁰ in June or August 2012 after enrolling in high school in September 2008.²¹ We do not examine Advanced Regents diplomas, as several CTE schools have course requirements in technical fields that make comparisons to students in non-CTE schools difficult.

From the broadest perspective, CTE students, on average, graduate at a rate higher than New York City public high school students in general, but are enrolled in a postsecondary institution six months after graduation at a slightly lower rate.

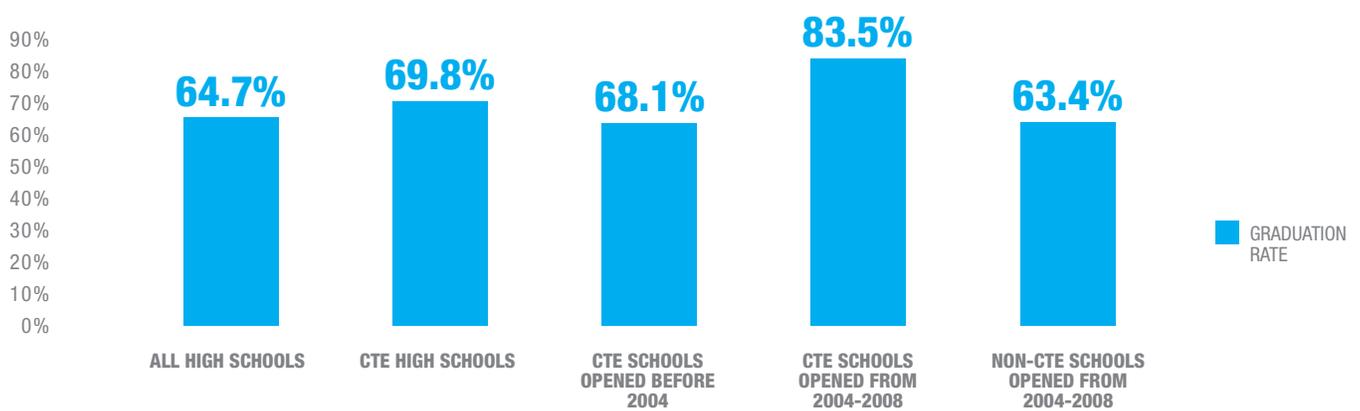
CHART 5: GRADUATION AND 6-MONTH POSTSECONDARY ENROLLMENT RATE*



*GRADUATION RATES ARE FOR THE 2012 COHORT—
POSTSECONDARY ENROLLMENT RATES ARE FOR THE 2011 COHORT.

Nearly 70 percent of students in CTE schools graduated in 2012, compared to the citywide rate of 65 percent. At the same time, postsecondary enrollment for CTE students (44 percent) is notably lower than the citywide rate (53 percent). According to public information, 35 percent of students in the 2012 cohort, in addition to graduating, also passed an industry-recognized technical assessment.²²

CHART 6: GRADUATION RATE BY AGE OF SCHOOL



AGE OF SCHOOL A FACTOR

On average, students attending CTE schools graduated at higher rates than those attending other schools. But much of those gains came at newer CTE schools. Students in CTE schools that opened before 2004 had graduation rates just a few points above the citywide average, whereas students in schools that opened between 2004 and 2008 graduated at markedly higher rates (83.5 percent).

It is difficult to isolate why newer CTE schools have such high graduation rates. We do know that across the high school system, new schools do not necessarily lead to higher graduation rates. In fact, looking at non-CTE schools, the graduation rate for schools that opened from 2004–08—many of which are small schools—is actually 6 percentage points lower than for older schools (63.4 percent compared to 69.4 percent).

Differences in the characteristics of students in newer CTE schools explain some of the differences graduation rates. Newer CTE schools enroll students with slightly higher scores on the 8th grade exams. Newer CTE schools also have lower shares of black students and higher proportions of white students. Students in newer CTE schools are also less likely to qualify for free or reduced lunch than old CTE schools (but still more so than non-CTE students). But after controlling for these differences in regression analysis, as discussed later, the graduation boost in CTE schools remains strong.

TABLE 3: NEWER VS. OLDER CTE SCHOOLS

	Newer CTE	Older CTE
Average 8th Grade Math/ELA Score	3.03	2.94
White	10.8%	4.2%
Black	32.3%	42.8%
Asian	11.8%	9.8%
Latino	45.1%	43.1%
Free/Reduced Lunch	78.3%	83.4%

CHART 7: GRADUATION RATE BY 8TH GRADE SCORE—ELA

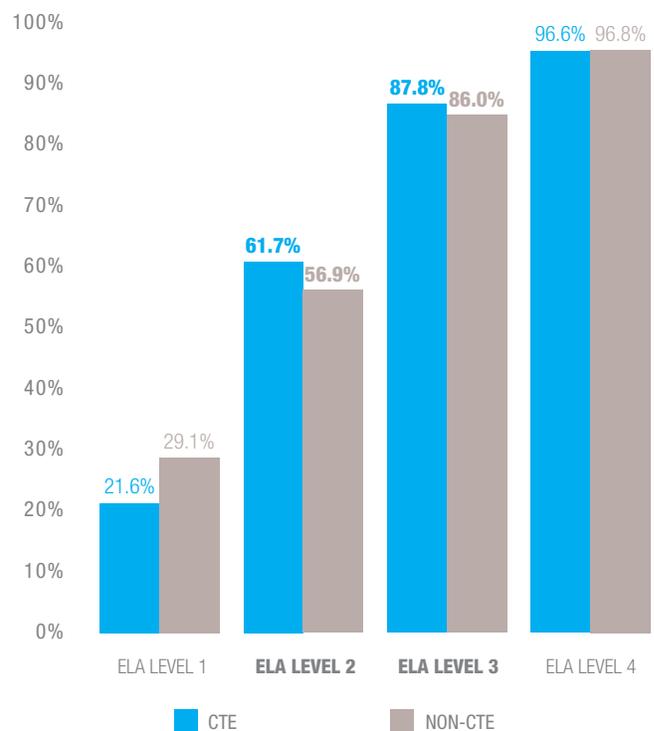
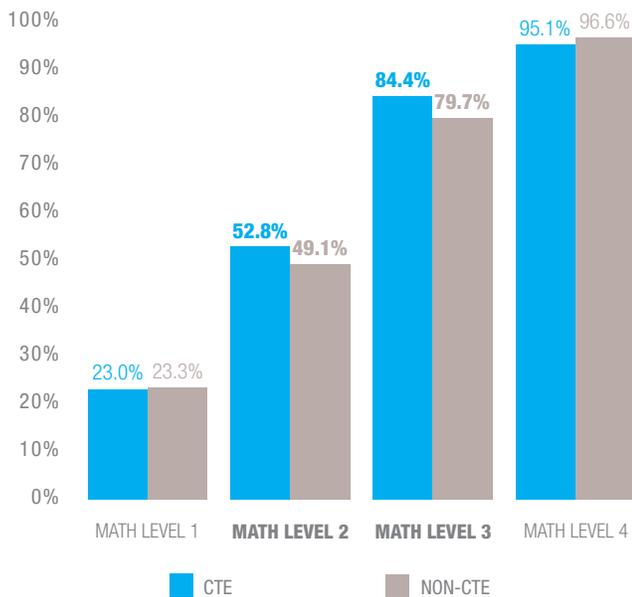


CHART 8: GRADUATION RATE BY 8TH GRADE SCORE—MATH



CTE student graduation rates are higher for students who enter at or just below proficiency levels

Across high schools, 8th grade test scores are very strong predictors of high school graduation. This is also true at CTE schools; however, these schools show stronger graduation rates for students at distinct areas of the 8th grade test score distribution. Students with Level 2 and Level 3 test scores are more likely to graduate if they attend a CTE school. Students graduated at different rates in relation to their performance on the 8th grade exams that measure proficiency in ELA and Math.

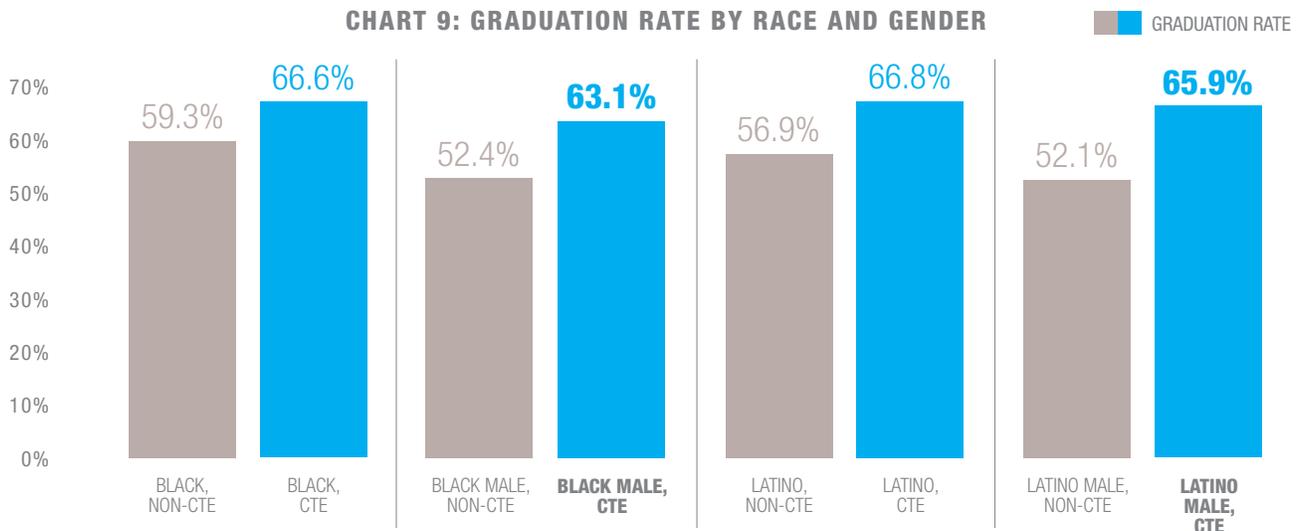
Students who scored at the lowest level on 8th grade exams, particularly in ELA, were much more likely to graduate if they attended a non-CTE school (29.1 percent) versus a CTE school (21.6 percent). But Level 2 ELA scorers, who make up a greater share of the overall 8th grade population (as presented in the previous section), graduated at higher rates in CTE schools (61.7 percent) than in non-CTE schools (56.9 percent). Level 3 ELA students graduated at slightly higher rates in CTE schools, while there was little difference in the graduation rates of Level 4 students, who graduate at extremely high rates across schools. In Math, as with ELA test scores, we see higher graduation rates for Level 2, and to an even greater extent, Level 3 scorers in CTE schools.

These data suggest that for students far below or far above proficiency, enrollment at a CTE school has little positive impact. However, for the wider population of students who are just below or just above proficiency, the graduation rates of CTE students are significantly higher than for non-CTE students.

Very strong outcomes for blacks and Latinos, in particular among males

Attending a CTE school is also associated with significantly higher graduation rates for blacks and Latinos, males in particular. Black and Latino males are precisely the group targeted in efforts—such as the Young Men’s Initiative—that seek to close the wide disparity in educational and employment outcomes across racial/ethnic groups. CTE appears to be a very successful intervention for these students.

CHART 9: GRADUATION RATE BY RACE AND GENDER



Black and Latino students who attended CTE schools graduated at much higher rates than their peers at non-CTE schools. The gains for males were even more pronounced. Only 52.4 percent of black males graduated from non-CTE schools, but 63.1 percent did so at CTE schools. And whereas just 52.1 percent of Latino male students graduated from non-CTE high schools, 65.9 percent of those attending CTE schools graduated.

Black and Latino students who attended CTE schools graduated at much higher rates than their peers at non-CTE schools.

The graduation outcomes for black and Latino males are very significant. For black males, the 10.7 percentage point difference represents a 20 percent improvement in graduation rates. For Latino males, the 13.8 percentage point difference represents an increased graduation rate in CTE schools of 26 percent.

Controlling for multiple factors through regression analysis: positive results hold

One question about comparing graduation rates by race and ethnicity is whether the results are influenced by other factors that are strong predictors of graduation, such as 8th grade test scores and, more specifically for Latinos, the lower rates of English Language Learners in the CTE student population. We use regression analysis to explore whether the apparent positive relationships with CTE could be explained by other factors, such as demographics (race/ethnicity, free/reduced lunch eligibility, and ELL status), 8th grade test scores, and whether or not students chose to attend the school in which they ended up enrolling. All regression coefficients reported here are significant ($p < .01$). (Full regression tables can be found at www.cssny.org/CTE.)

Our first regression model examines the relationship between graduation and CTE participation broadly, while controlling for the following factors: race/ethnicity; being eligible for free/reduced lunch; attending a school that the student ranked as one of their top three choices; Math/ELA 8th grade test scores; being an English Language Learner.

In this model, attending a CTE school, while controlling for all these other factors, was associated with an average increased likelihood of graduating of 4.0 percentage points, compared to similar students who did not attend CTE schools. The base case student in this model—someone not in a CTE school, white, female, not eligible for free/reduced lunch, attending a school that was not in their top three choices, and with an exactly average combined Math/ELA 8th grade test score—has a 70.6 percent likelihood of graduating high school. But if the only above variable that changes about this student is that they went to a CTE school, then they have a 74.6 percent likelihood of graduating. This is a strong positive outcome.

When we adjust the model to add the distinction of attending a new CTE school versus an older CTE school, we still see significant, positive graduation results across CTE schools. Students who attend older CTE schools see a 2.6 percentage point increased likelihood of graduating: the average base case goes from 70.5 percent graduation likelihood to 73.1 percent. However, if that student attends a newer CTE school, they have an 86.2 percent chance of graduating—a remarkably high figure, when controlling for other factors.

Despite the fact that some newer CTE schools are enrolling students with slightly higher test scores and other characteristics more traditionally linked to graduation success, they are still graduating more students, even controlling for these factors. In this model, students in newer CTE schools see an average “CTE graduation boost” that is six times the magnitude (15.7 percent vs. 2.6 percent) of that enjoyed by students in older CTE schools.

The fact that we saw slightly lower graduation results for older CTE schools than non-CTE schools in cross-tabulations appears to be more a result of the fact that older CTE schools accept students with lower test scores and other characteristics less associated with graduation. Among similar students, older CTE schools still outperform non-CTE schools. But newer CTE schools have results that are stunningly high in comparison.

Regression analysis also allows us to examine our initial cross-tabulations across race and gender more closely. Unlike white and Asian students, blacks and Latinos entering CTE schools score slightly higher on 8th grade exams than their

peers in non-CTE schools. And since Latino students in CTE schools are much less likely to be English Language Learners, it is important to understand if these differences are driving the higher graduation rates for blacks and Latinos in CTE schools.

The results of regression analysis show that CTE participation has a statistically significant positive impact on graduation rates for black and Latino students overall (+3.8%), and males, in particular (+4.7%). (These results are lower than initial cross-tabulations due to the fact that black and Latino CTE students score slightly better on 8th grade exams than their non-CTE peers.) But, distinguishing enrollment in newer CTE schools identifies an even stronger positive relationship through regression: +15.6 percentage points for blacks and Latinos overall, and +17.3 percentage points for black and Latino males.

Logistic regression: CTE gains are strongest for students with just below average 8th grade test scores

We use a different model of regression analysis to more deeply examine the relationships between graduation rates, CTE participation, and the distribution of students' 8th grade test scores.²³ Chart 10 plots the relationship between graduation and 8th grade test scores for CTE and non-CTE students who are male and either black or Latino. As the chart illustrates, the CTE benefit is greatest for students just at or below the average combined 8th grade Math and ELA test score. The graduation rate boost peaks at 6.7 percentage points for those students who are 0.4 points below the 3.02 mean test score, and is above four percentage points for students with scores between 2.32 and 3.03.

CHART 10: GRADUATION RATES BY 8TH GRADE MATH/ELA TEST SCORES FOR BLACK AND LATINO MALES ACROSS ALL CTE SCHOOLS

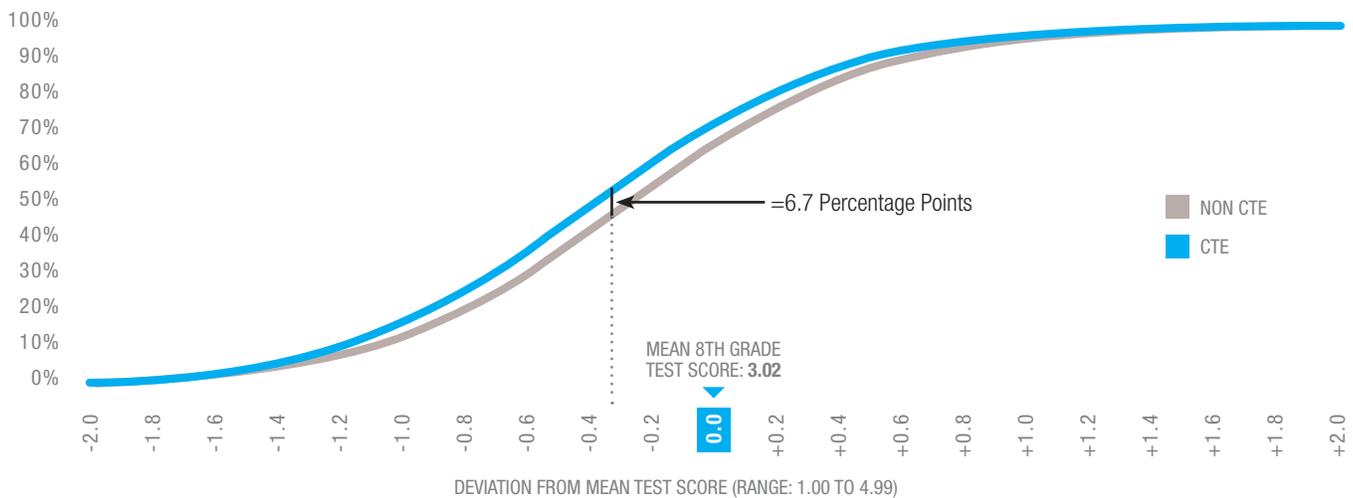
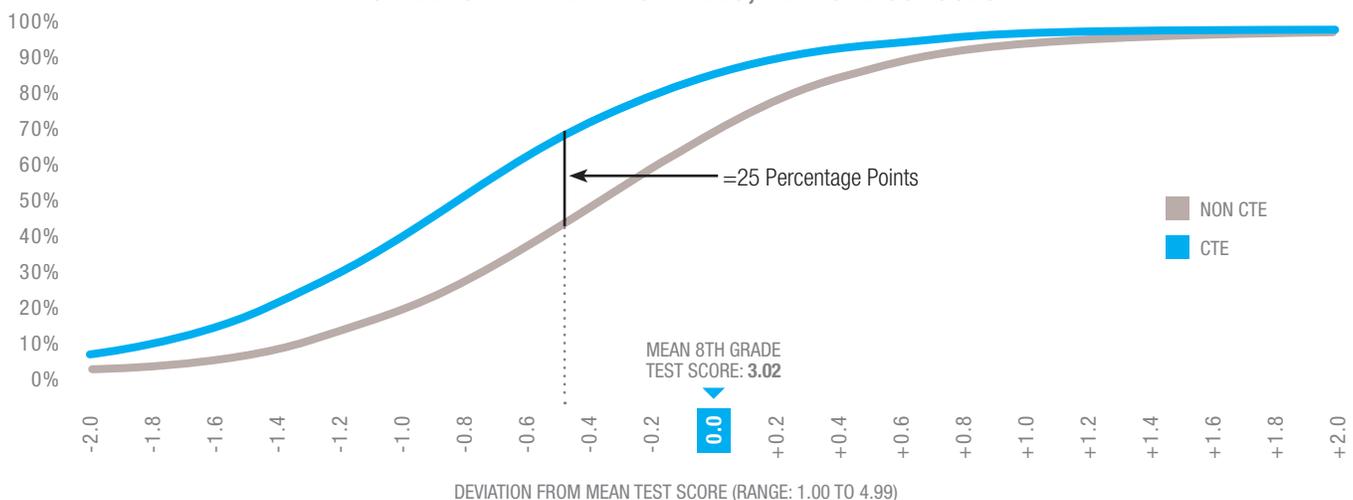


CHART 11: GRADUATION RATES BY 8TH GRADE MATH/ELA TEST SCORES FOR BLACK AND LATINO MALES, NEW CTE SCHOOLS



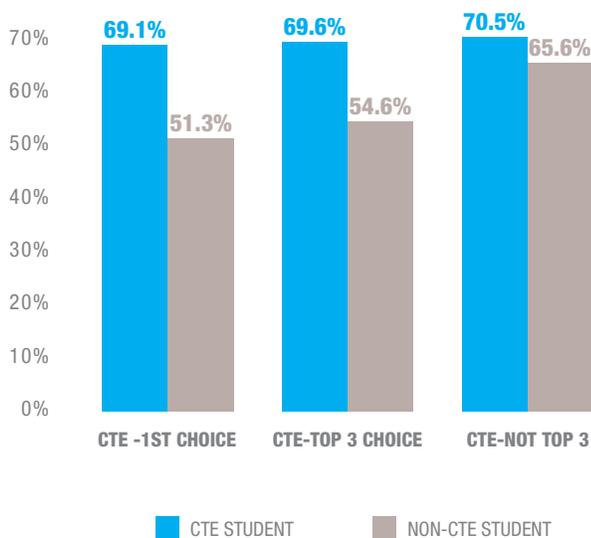
From this analysis, CTE participation is associated with few gains for students at the lower and higher ends of the 8th grade proficiency distribution. But students who are just below proficiency when entering 9th grade, and black and Latino males in particular, appear to reap very strong gains from attending a CTE school.

The graduation boost, as shown in Chart 11, for black and Latino males in newer CTE schools, again controlling for 8th grade test scores, is even more profound—even to the point of being stunningly high. The graduation gap in new CTE schools is wider and more dispersed throughout the 8th grade test score distribution. At its peak, for students with test scores 0.5 points below the 3.02 average, black and Latino male students have an increased likelihood of graduating of 25 percentage points. A black or Latino male entering high school with an average score of 2.6 on their 8th grade exams has, on average, a 43 percent likelihood of graduating from a non-CTE school, but a 68 percent likelihood of graduating from a new CTE school.

High CTE graduation rates not related to student preferences (school choice)

Students at CTE schools graduated at similar rates whether their CTE school was their top choice, one of their top three choices, or outside of their top three choices. The higher graduation rates at CTE schools do not appear related to the intensity of students’ preferences to attend their school.

CHART 12: GRADUATION RATE BY SCHOOL CHOICE



However, students that listed a CTE school as their top choice but did not attend a CTE school graduated at extremely low rates (51.3 percent). The NYCDOE may want to consider examining which students are failing to get into CTE schools, especially since most CTE schools do not screen for students based on academic proficiency. One wonders whether these students would have fared better if they were able to attend the career-oriented school for which they stated a strong preference in their high school application.

While students who are most interested in attending a CTE school but are not matched to that school fare poorly, this is not true for students in non-CTE schools who do not get into their first choice. In fact, outside of CTE schools, students who did not end up enrolling in their top choice actually graduate at higher rates (70 percent) than students who did get into their first choice (65.4 percent). It appears that the bumping/matching process that happens for students who do not seek to attend CTE schools is working—they end up in schools where they thrive. For students seeking CTE who do not end up in those schools, the NYCDOE is not finding them the right alternatives.

College readiness: CTE students less prepared for college—except for Latinos, who see higher college readiness in CTE schools

The NYCDOE did not provide us with student-level data about college enrollment, preventing us from examining college-going among sub-groups of students. However, we can use data from each student’s high school performance as a proxy for their college readiness. The City University of New York (CUNY) sets a helpful standard: students who achieve scores of 75 or higher on the New York State English Regents Exam, and 80 or higher on the New York State Math A, B, Sequential Math II or III Regents exams, do not have to take tests to determine whether they need remediation in reading, writing, or math. The NYCDOE uses a similar “Aspirational Performance Measure” (APM) to denote college readiness. We should note that these are just two exams, and the ability to succeed in college involves a broad range of factors.

APM college readiness rates are low across schools: just 22.2 percent of students meet the standard.²⁴ But unlike graduation rates, students in CTE schools achieve lower levels of college readiness than students in non-CTE schools. Only 17.8 percent of CTE students meet the measure, compared to 22.6 percent of non-CTE students.

When looking at students based on their performance on 8th grade exams, we can isolate the differences in college readiness. The major disparities are among Level 3s, students who are proficient on Math or ELA in 8th grade. These students, particularly those with ELA Level 3 scores, are much less likely to achieve college readiness on the APM metric at CTE schools. This is despite the fact that Level 3 students are slightly more likely to graduate from high school if they attended CTE schools than other schools.

TABLE 4: COLLEGE READINESS AMONG MATH/ELA LEVEL 3 STUDENTS

ELA Level 3	Math Level 3
CTE: 30.9%	CTE: 20.0%
Non CTE: 43.9%	Non CTE: 24.8%

CTE schools do a much better job than non-CTE schools getting Level 2s and, to a lesser extent, Level 3s to graduate. But Level 3s in CTE schools, despite passing their Regents exams, are not achieving high scores as much as they do in other schools.

When looking at college readiness by race, we again see stronger results for CTE schools. Blacks who attend CTE schools do not show a lower rate of college readiness than black students attending other schools, and Latinos in CTE schools have a considerably higher rate of college readiness than those in other schools—this result holds even when controlling for ELL status.

TABLE 5: COLLEGE READINESS BY RACE/ETHNICITY

	Black	Latino	Black Males	Latino Males
CTE	11.4%	16.7%	8.5%	16.1%
Non-CTE	11.4%	12.2%	8.7%	10.7%

There are also differences in college readiness outcomes among older and newer CTE schools. CTE schools that were created between 2004 and 2008 have college readiness rates (21.2%) that are very close to non-CTE schools. The rate for students in older CTE schools (17.3%) explains much of the gap in college readiness between CTE and non-CTE students.

Regression analysis shows variation in college readiness outcomes

Using regression analysis, we examine the likelihood of college readiness for CTE students overall. Using the same models as we used with graduation, we find that attending a CTE school is associated with a decreased likelihood of meeting the APM college readiness standard, by 2.6 percentage points. This decrease is smaller than the overall difference (17.8 percent to 22.6 percent, 4.8 percentage points) because of the fact that CTE schools enroll more students with factors associated with decreased college readiness independently (including being black or Latino, male, or having low 8th grade scores). Looked at separately, Latino students actually have increased college readiness in CTE schools, and black students have the same rates in CTE and non-CTE schools.

In the college readiness models, we did not find statistically significant differences for students in new versus old CTE schools, either broadly or for subgroups of students. From this analysis, it appears that the cross-tab differences in college readiness rates between new and old CTE schools are attributable to differences in their student bodies.

SUMMARY

CTE schools, in particular those created since 2003, are graduating higher shares of students than non-CTE schools, with specific and marked successes among black and Latino males, and students just below 8th grade academic proficiency standards. But these graduation results may not yet be leading to corresponding increases in the ability for students to perform in post-secondary education.

How do individual CTE schools fare compared to similar non-CTE schools?

This section presents how individual CTE schools compare in terms of graduation and post-secondary enrollment to other schools with similar student bodies. Whereas the previous sections reviewed student-level data without differentiating among schools (except if they were older or newer), this section examines the performance of specific schools. In order to control for major differences, we compare the graduation and college enrollment rates of CTE and non-CTE schools with similar student bodies.

We find that several specific newer and older CTE schools stand out for strong school-wide graduation and college enrollment outcomes. As the NYCDOE considers CTE school expansion and improvement, it would be worth examining the schools mentioned below to see what they are doing right.

We use the NYCDOE's peer index to compare similar schools. The peer index includes a range of variables about the student population at the school.²⁵ Schools with lower peer index scores have student populations with higher shares of characteristics less associated with graduation. Using school-level data in the context of the peer index,²⁶ we are able to examine school-level outcomes only for schools with similar student bodies. In total, we examined 12 peer index groups. In brief, we find:

Very strong graduation rates at the school level

64 percent (16 of the 25 schools in our sample) have what should be considered strong graduation outcomes. Thirteen, a slight majority, have graduation rates higher than the average graduation rate of schools with similar peer index scores. Another three schools have graduation rates that are slightly below the average graduation rates of schools with similar

peer index scores, but still graduate more than 82 percent of their students, far above the citywide average. These findings buttress the student-level data from across CTE schools showing higher graduation rates.

College enrollment outcomes, at the school level, are better than student-level data on college readiness

Fifty-nine percent (13 of 22) of CTE schools for which postsecondary enrollment data was available have relatively strong postsecondary enrollment outcomes. Seven schools had postsecondary enrollment rates that were higher than the average of schools with similar peer index scores, and six others had rates less than 2.5 percentage points lower than their peer index averages. These data suggest that the low college readiness and enrollment across all CTE students is being weighed down by a relatively small share of CTE schools whose students have very poor college-related outcomes.

Some schools stand out

Seven CTE schools particularly stand out within the peer index comparison: W.H. Maxwell; Automotive; High School of Computers and Technology; Urban Assembly New York Harbor School; Academy for Careers in Television and Film; Ralph R. McKee; and the High School for Construction Trades, Engineering, and Architecture. Other CTE schools have graduation rates that are higher than the average in their peer index, but these seven schools either have graduation rates that are much higher than their peer index average, or have both higher graduation and college enrollment rates.

Four of these standout schools were created since 2003, and three are older-generation CTE schools, suggesting that it is a subset of older CTE schools that is bringing down the average graduation rate across older CTE schools, not that older CTE schools are consistently low-performing. And while there are stark differences among older CTE schools, there is nothing that singlehandedly explains why one performs well and another does not. Some have seen their enrollments drop, making them more like the newer schools with small class sizes. However, there are older, large CTE schools that also do very well.

CHART 13: SCHOOLS WITH PEER INDEX SCORES BETWEEN 1.06 AND 1.24

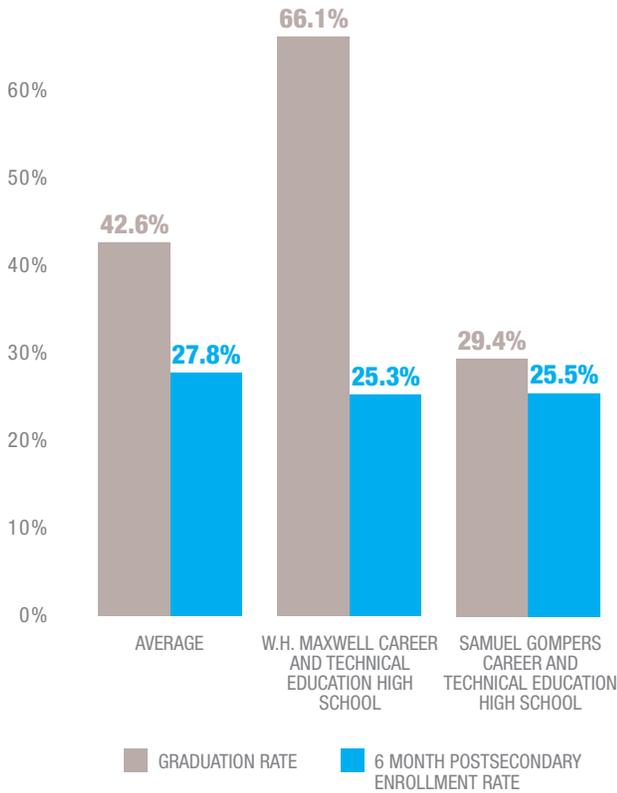


CHART 14: SCHOOLS WITH PEER INDEX SCORES BETWEEN 1.35 AND 1.45

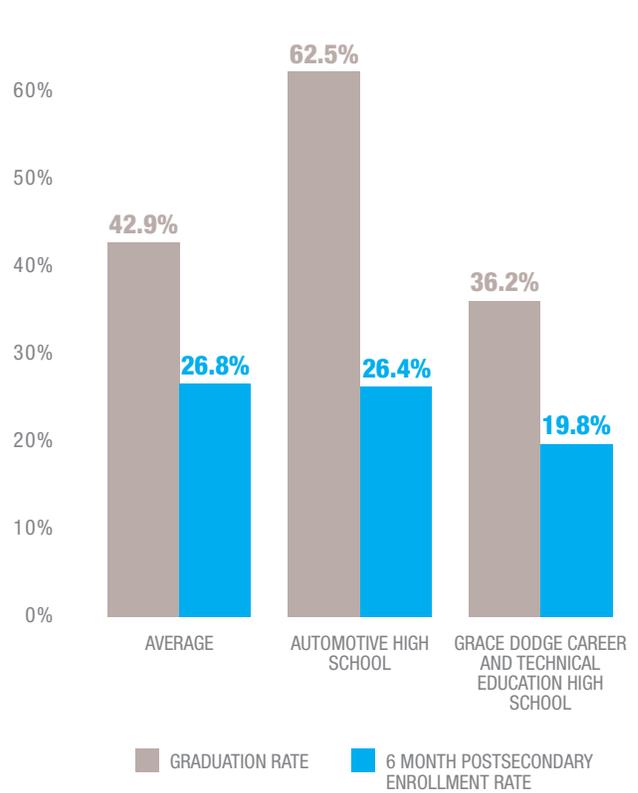


CHART 15: SCHOOLS WITH PEER INDEX SCORES BETWEEN 1.91 AND 1.99

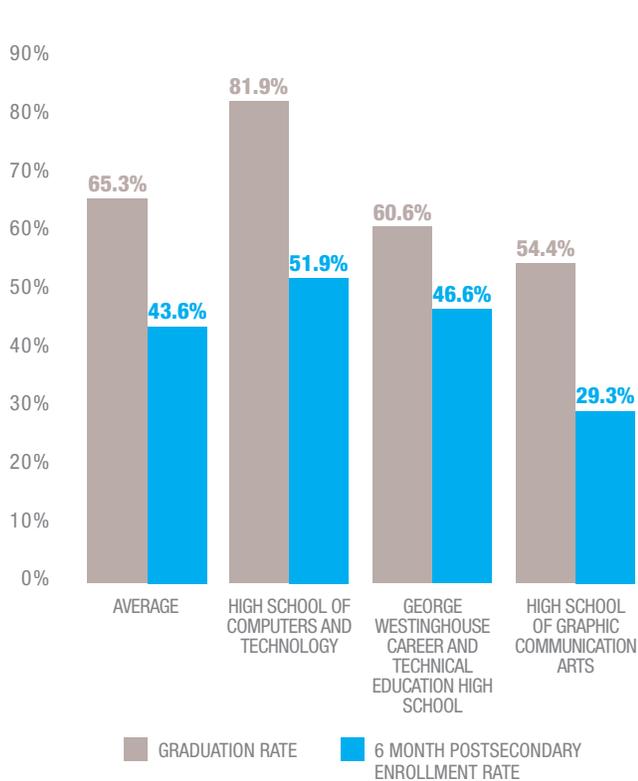
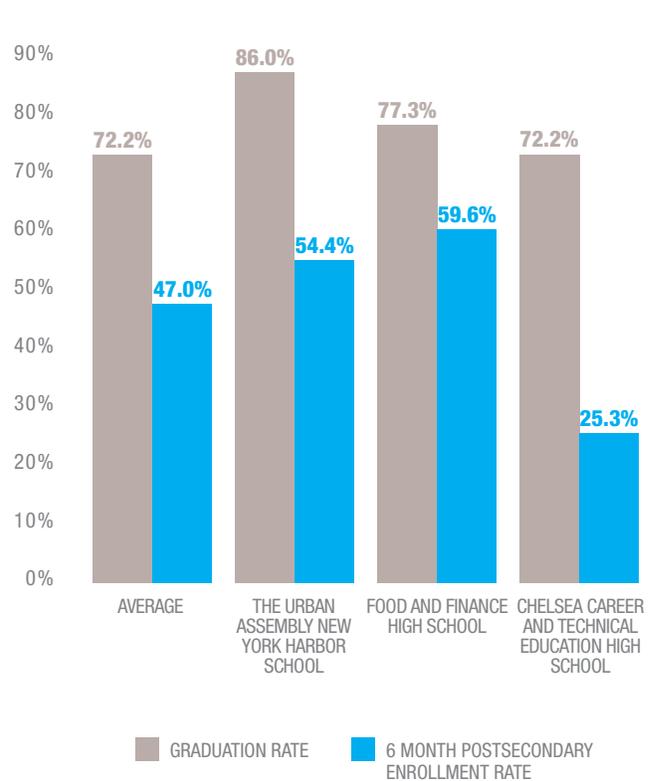


CHART 16: SCHOOLS WITH PEER INDEX SCORES BETWEEN 2.14 AND 2.20



In schools with the lowest peer index scores (between 1.06 and 1.24), W. H. Maxwell Career and Technical Education High School stands out, graduating 66.1 percent of its students, a rate just above the city average, and far above the average for its peer group. The other CTE school in this peer group, Samuel Gompers CTE High School, graduates just 29.4 percent of its students (and is slated for closure).

Still in the lower part of the peer index distribution, Automotive High School stands out for very strong relative graduation rates. Yet as with W. H. Maxwell High School, its graduates are not more likely to attend college. Grace Dodge CTE High School is also slated for closure.

A few steps higher up the peer index, we see a set of schools with outcomes that come close to matching the average for New York City public high schools. Within this group, the High School of Computers and Technology excels: it graduates 81.9 percent of its students, and sends 51.9 percent to college, rates that are well above the average school and the other two CTE schools in its peer group. The High School of Graphic Communications Arts is slated for closure (the fourth school slated for closure is Jane Addams).

Schools with peer index scores between 2.14 and 2.20 have student bodies with above average outcomes: 72 percent graduation and 47 percent college enrollment. Here, the Urban Assembly New York Harbor School stands out for its 86 percent graduation rate and its 54 percent college enrollment. It should be noted that the Harbor School does not screen its students. Priority is only given to those who attend an open house or information session. Applicants' middle school grades or test scores are not considered. These schools are considered "limited-unscreened." With the exception of the High School for Construction Trades, Engineering, and Architecture (which screens for students' incoming test scores), all of the new schools opened since 2003 are limited-unscreened.

Food and Finance High School also outperforms schools with similar peer index scores particularly with respect to its 60 percent college enrollment rates. And as with the Harbor School, Food and Finance is limited-unscreened, in that students only need to show an interest in the school to gain priority for admission.

Chelsea CTE High School matches its peer group's graduation rate identically, but is far behind in its postsecondary enrollment. Harbor and Food and Finance are relatively new schools, having been opened in 2003 and 2004 respectively. Chelsea CTE was established as a high school in 1922 and was known until recently as Chelsea Vocational High School, home to a student body in the thousands. Over the past several years, the school has made a series of changes to its programming and reduced its student body to just 465 students.

At the slightly higher end of the peer index groups, between 2.30 and 2.37, the average graduation rate is 80 percent, but the Academy for Careers in Television and Film far exceeds that, with 96.2 percent of its first cohort of students having graduated. Clara Barton High School, an older CTE school, has a graduation rate (72.6 percent) that is above the citywide average, but lower than schools with similar peer index scores.

Conclusions and Recommendations

This section summarizes the major findings of our analysis, and offers ideas about how to use them to expand and improve CTE programming in New York City.

Conclusions

WHO CTE SCHOOLS SERVE

CTE schools serve students who are traditionally less likely to graduate

On average, CTE schools serve students with lower 8th grade test scores than non-CTE schools. CTE schools are also much more likely to serve students with other factors that are, on average, associated with lower graduation rates: being poor, black or Latino, or having a special education designation. Within the CTE portfolio, newer CTE schools opened since 2003 serve students with 8th grade test scores that are higher than those served by older CTE schools, but not notably different from the citywide average. New CTE schools still serve a greater share of black, Latino, and poor students than the citywide average, although to a lesser extent than older CTE schools.

English Language Learners are very underrepresented in CTE schools

CTE schools serve a very low relative share of English Language Learners (ELLs), despite serving a high population of Latino students. Latino and Asian students who enroll in CTE schools are far less likely to be ELLs than those groups in non-CTE schools.

Queens students are underserved by CTE, despite their demand for it

Twenty-eight percent of public high school students reside in Queens, and 33 percent of students who select a CTE school as their top choice are from the borough, but just 7 of 45 fully-designated CTE schools (16 percent) are

located in that borough. The supply of CTE schools does not meet the demand in Queens. As a result, Queens students are more likely to be shut out of CTE than students from any other borough. Those who are accepted are willing to travel to other boroughs to attend a CTE school, more than students from any other borough, perhaps the strongest demonstration of the need to create more CTE schools in Queens.

STUDENT OUTCOMES IN CTE SCHOOLS

Students attending CTE schools are more likely to graduate

In various analyses, graduation rates for students in CTE schools appear higher than those for similar students in other schools. CTE schools have higher graduation rates even though they have more students with below-average 8th grade test scores, black and Latino students, as well as students eligible for free/reduced lunch. Comparing students by race/ethnicity, 8th grade test scores, and their preference to attend the school does not change the higher graduation finding. Using regression analysis to control for multiple student characteristics and measuring the effects for statistical significance we found that CTE students, on average, are four percentage points more likely to graduate than non-CTE students. This is a notable difference in the context of the average citywide graduation rate of approximately 65 percent.

New CTE schools have the strongest graduation outcomes, and far exceed the outcomes of older CTE and non-CTE schools

The outcomes for students in newer CTE schools, those created since 2003, are very strong, and far exceed the graduation rates of students in older CTE schools and non-CTE schools. New CTE schools have graduation rates that also far exceed those of non-CTE schools that were also created since 2003; it is not simply that these are newer, smaller schools. The strong graduation rates for CTE students hold up in regression analysis, even controlling for the fact that newer CTE schools enroll students with factors associated with slightly higher graduation rates than older CTE schools.

Black and Latino males see the greatest increases in graduation from CTE participation

Citywide, black and Latino students, and males in particular, have, on average, the lowest graduation rates. But in CTE schools, these subgroups graduate at much higher rates than they do in other schools. The gains to black and Latino students, even controlling for a range of other factors (including the lower presence of English Language Learners in CTE schools), particularly in new CTE schools, are remarkable.

CTE appears most beneficial for students just below the middle of the academic ability distribution—and less effective at both tails

Whereas CTE was once thought of as programming for students with the lowest academic abilities, this is not borne out by our data; students in the lowest end of the 8th grade test score distribution are actually less likely to graduate in CTE schools than in other schools. This is particularly notable for students with low English Language Arts test scores (literacy abilities), who are far less likely to graduate if they attend a CTE school. Students at the very top end of the test score distribution see no difference in graduation rates in CTE schools, but students in the middle of the distribution, particularly just below proficiency, are significantly more likely to graduate if they attend CTE schools.

Students who really want to attend a CTE school but are not enrolled in one have extremely poor graduation outcomes

Students who select a CTE school as their top choice for high school but are not enrolled by the NYCDOE into that school have extremely low graduation rates—just 51 percent of these students graduate (compared to 69 percent of CTE students who did get into their top choice). Students who place a non-CTE school as their top choice and are not enrolled in that same school actually do slightly better than students who did get into the non-CTE school of their choice (70 percent vs. 68 percent). It appears that the NYCDOE's school matching efforts are working for students who do not choose CTE. But those who do choose CTE, and are not lucky enough to be enrolled in the school of their choice, fare poorly.

College readiness outcomes are weaker in CTE schools

College readiness levels across New York City high schools are extremely low. And students in CTE schools are less likely by 4.8 percentage points, (17.8 percent vs. 22.6 percent) than those in non-CTE schools to meet the NYCDOE's measure of college readiness. In regression analysis, we find that these differences are partly due to the differences in student populations, leading to a smaller drop in college readiness rates for CTE students (2.6 percentage points). And promisingly, among student subgroups, Latino males actually have higher college readiness results in CTE schools, and black males see no difference in college readiness in CTE and non-CTE schools.

SCHOOLS THAT STAND OUT

When using the NYCDOE's peer index to compare schools with similar student populations, several schools—old and new—stand out for strong performance: W.H. Maxwell, Automotive, High School of Computers and Technology, Urban Assembly New York Harbor School, Academy for Careers in Television and Film, Ralph R. McKee, and High School for Construction Trades, Engineering, and Architecture. The NYCDOE should look to these schools as potential models in its ongoing new school development.

Recommendations

Our analysis of student outcomes in CTE schools suggests several recommendations for the direction of CTE policy in New York City, including:

▶ **CTE schools should be an increasing share of new school development.**

The graduation results of CTE schools, particularly among black and Latino males, speak for themselves. The NYCDOE should seek to aggressively expand the CTE portfolio, using models similar to those developed since 2003: smaller schools, with a single industry focus, aligned to projected employer demand. One clear area for expansion is Queens, which has the highest share of students who seek to attend a CTE school, despite there being relatively few CTE schools to choose from in the borough. CTE schools should also seek to enroll more English Language Learners, who are very underrepresented in CTE schools.

▶ **As part of expansion efforts, more data should be collected and analyzed on students in CTE schools.**

With 20 CTE schools opening from 2009 to 2013, the NYCDOE will have an opportunity to track several large cohorts of CTE students and evaluate their high school careers and outcomes. Additional qualitative research should be done to figure out what works in CTE schools. And data collection should include employment outcomes, in addition to rates of high school completion and postsecondary education.

▶ **New CTE schools should target students just below the averages for proficiency in English Language Arts and Math.**

Our analysis show that the strongest gains in graduation from CTE schools accrue to those students just below the mean in middle school test scores. The NYCDOE should seek to target this population directly as it develops and implements admission procedures at its new CTE schools. Students with very low and very high middle school test scores see, on average, little or no graduation gains in CTE schools. Whereas CTE was once thought of as programming for the least proficient students, our data show that this is not the case today; students with the lowest 8th grade test scores perform worse in CTE than non-CTE high schools.

▶ **CTE schools need to include a greater focus on college readiness.**

Despite higher graduation results, CTE students are, on average, less likely to meet the NYCDOE's metrics for college readiness. The promise that CTE schools show in assisting greater shares of students to meet the bar of graduation is not enough if these students are not equipped to excel at the next level. CTE schools should work to ensure that students can meet these benchmarks if they hope to shed the reputation as an alternative to college preparation programs. This is particularly true in light of the fact that although CTE schools may offer the chance of employment directly after high school, a two- or four-year college degree is an increasing requirement of jobs that pay family-sustaining wages.

Appendix A: Background on the CTE Schools in Our Sample

One key difference among schools is that programs have varying methods of admission, which are as follows:

A=Limited Unscreened; E=Educational Option; P=Audition; S=Screened; U=Unscreened; Z=Zoned

Limited Unscreened: Programs that give priority to students who demonstrate interest in the school by attending a school's Information Session or Open House events or visiting the school's exhibit at any one of the High School Fairs.

Educational Option: Programs designed to attract a wide range of academic performers. Students applying to an Educational Option program are categorized into one of three groups based upon the results of their 7th grade standardized reading test score:

- ▶ Top 16% - High
- ▶ Middle 68% - Middle
- ▶ Bottom 16% - Low

From the applicant pool, half the students are chosen by the school administration and half are selected randomly. However, students who score in the top 2% on the 7th grade English Language Arts reading exam will automatically be matched to the Ed. Opt. program if they listed it as their first choice. If a child is in the top 2%, it is indicated on his/her application next to the reading score.

Audition: Programs that require that a student demonstrate proficiency in the specific performing arts/visual arts area for that program. For example, if a student auditions for a drama program, he/she may have to prepare a monologue as part of the audition. The audition requirements, dates and times are listed with the program on each school's directory page.

Screened: Programs in which students are ranked by a school based on the student's final 7th grade report card grades and reading and math standardized scores. Attendance and punctuality are also considered. There may also be other items that schools require to screen applicants such as an interview, essay or additional diagnostic test score.

Unscreened: Programs in which students who apply are selected randomly.

Zoned: Programs that give priority to students who apply and live in the geographic zoned area of the high school. There are zoned high schools in Brooklyn, Staten Island, Queens and the Bronx. Manhattan does not have zoned high schools.

CTE Schools in Our Sample: Summary Table

Year Opened	School	Programs	Borough	Cohort Size
1905	Chelsea Career and Technical Education High School	A+ Computer Repair; Graphic Design; Cisco Networking Academy	Manhattan	133
1913	W.H. Maxwell Career and Technical Education High School	Apparel Design; Cosmetology; Communications Media; Medical Assistant/Billing and Coding; Vision Technology	Brooklyn	227
1920	Queens Vocational and Technical School	A+ Computer Repair; Plumbing; Cosmetology; Electrician; Computer Graphics; Virtual Enterprise/Entrepreneurship; Electrical Engineering; Software Engineering Pilot	Queens	326
1925	Grace Dodge Career and Technical Education High School	Academy of Finance; Academy of Information Technology; Emergency Medical Technician; Law Academy/Legal Studies; Medical Billing and Coding; Nursing Assistant; Vision Technology; Communications Media; Computer Installation and Repair Technology; Desktop Publishing	Bronx	334
1932	Alfred E. Smith Career and Technical Education High School	Auto body – Collision Repair; Automotive Technician; Theme Neutral	Bronx	253
1935	Samuel Gompers Career and Technical Education High School	CISCO Networking Academy; Computer Aided Design (CAD); Desktop Publishing; A+ Computer Repair; Electronic and Computer Audio Technology; Pre-Engineering	Bronx	214
1935	Ralph R. McKee Career and Technical Education High School	Automotive Technology; CISCO Networking Academy; Carpentry; Cosmetology; Graphic Design; Software Engineering Pilot	Staten Island	184
1937	Jane Addams High School for Academic Careers	Cosmetology; Law Academy/Legal Studies; Nursing Assistant; Entrepreneurship/Virtual Enterprise	Bronx	226
1938	Automotive High School	Automotive Service Technician; Pre-Engineering	Brooklyn	176
1940	The High School of Fashion Industries	Fashion Design; Fashion Merchandising/Marketing; Commercial Arts & Illustration; Visual and Fashion Merchandising	Manhattan	389
1940	Clara Barton High School	Dental Assistant; Dental Laboratory Technician; Medical Assistant/Billing and Coding; Nursing Assistant; Practical Nursing; Vision Technology; Bio-Med Technology/Medical Lab Assistant	Brooklyn	391

Year Opened	School	Programs	Borough	Cohort Size
1941	Transit Tech Career and Technical Education High School	Transit Industrial Electronics; Transit Industrial Electrical Transit Technology; A+ Computer Repair	Brooklyn	334
1957	William E. Grady Career and Technical Education High School	A+ Computer Repair; Automotive Technician; Construction Technology; Culinary Arts; Heating, Ventilation, and Air Conditioning; Audio Visual	Brooklyn	293
1958	High School of Graphic Communication Arts	Commercial Arts and Illustration; Commercial Photography	Manhattan	423
1958	Aviation Career & Technical Education High School	Aviation Maintenance Technology	Queens	462
1959	Thomas A. Edison Career and Technical Education High School	A+ Computer Repair; Automotive Technology; Mechanical Drafting; CISCO Networking Academy; Commercial Arts and Illustration; Electrician; Robotics; Graphic Arts; Collision Repair; Web Design; Medical Lab and Allied Health Pro	Queens	539
1960	Art and Design High School	Architectural Design; Cartoon and Animation, Interactive Tech; Commercial Photography; Film and Video Production; Apparel Design; Illustration and Graphic Design	Manhattan	331
1996	George Westinghouse Career and Technical Education High School	A+ Computer Repair; CISCO Networking Academy; Computer Support Services; Culinary Arts; Electrician; Web Design; Vision Technology	Brooklyn	236
2003	The Urban Assembly New York Harbor School	Professional Diver; Marine Science Research; Vessel Engineering; Vessel Operations; Aquaculture; Robotics	Manhattan	86
2004	Food and Finance High School	Culinary Arts	Manhattan	97
2004	High School of Computers and Technology	Computers and Technology	Bronx	116
2006	High School for Construction Trades, Engineering and Architecture	Architecture; Construction Technology; Engineering	Queens	218
2008	High School for Innovation in Advertising and Media	Advertising and Media Design	Brooklyn	64
2008	Academy of Innovative Technology	Academy of Information Technology/Web Design; Information Technology/Game Systems Design; AOIT: Computer Repair	Brooklyn	103
2008	Academy for Careers in Television and Film	Film and Video Production	Queens	104

CTE Schools Opened from 2009-2013

Year Opened	School	Programs	Borough
2009-10	Quest to Learn	Bioinformatic Systems; Game Systems Design, Visual Systems; Visual Communications	Manhattan
2009-10	Business of Sports School	Entrepreneurship and Business Management	Manhattan
2009-10	The Urban Assembly School for Green Careers	Environmental Technology; Environmental Technology/Horticulture	Manhattan
2009-10	City Polytechnic High School of Engineering, Architecture and Technology	Pre-Engineering	Brooklyn
2010-11	Academy for Health Affairs	Patient Care	Brooklyn
2010-11	Pathways in Technology Early College High School (P-Tech)	Computer Science; Engineering; Entrepreneurship/Virtual Enterprise	Brooklyn
2011-12	Bronx Design and Construction Academy	Carpentry/Carpenter; Electrician; HVAC; Plumbing Technology; Pre-Engineering/Architectural Drafting	Bronx
2011-12	Crotona International High School	Computer Software and Media Applications, Other	Bronx
2011-12	The Urban Assembly Gateway School for Technology	Digital Design and Animation; A+ Computer Repair; Software Engineering Pilot	Manhattan
2012-13	Academy for Software Engineering	Software Engineering	Manhattan
2012-13	High School for Energy and Technology	Facilities Management/HVAC	Bronx
2012-13	School for Tourism and Hospitality	Academy of Hospitality	Bronx
2012-13	Union Square Academy for Health Sciences	Dental Assistant/Pharmacy	Manhattan
2013-14	Bronx Academy for Software Engineering	Software Engineering	Bronx
2013-14	Energy Tech High School	Energy Technology	Queens
2013-14	Health Education and Research Occupations	Health, Education and Research Occupations	Bronx
2013-14	Institute for Health Professions at Cambria Heights	Health Professions	Queens
2013-14	Stephen Mather for Building Arts and Craftmanship High School	Building Arts and Historic Preservation	Manhattan
2013-14	Urban Assembly School for Emergency Management	Emergency Management	Manhattan
2013-14	Urban Assembly School for Global Commerce	Global Commerce	Manhattan

Location of CTE Schools in Our Study

Four of the schools below are slated for closure. They are: Samuel Gompers, Jane Addams, High School for Graphic Communication Arts, and Grace Dodge.

Queens (5)

- ▶ **Astoria (2):** Queens, Aviation
- ▶ **Hillcrest/Fresh Meadows (1):** Thomas Edison
- ▶ **Kew Gardens/Woodhaven (1):** HS for Construction Trades
- ▶ **Sunnyside/Woodside (1):** Academy for Careers in TV and Film (this is actually in LIC)

Bronx (5)

- ▶ **Kingsbridge Heights/Mosholu (2):** Grace Dodge, High School for Computers and Technology
- ▶ **Highbridge/S. Concourse (2):** Alfred E. Smith, Jane Addams
- ▶ **Mott Haven/Hunts Point (1):** Samuel Gompers

Manhattan (6)

- ▶ **Chelsea/Clinton/Midtown (3):** Food and Finance, HS for Fashion Industries, HS for Graphic Comm. Arts
- ▶ **Stuytown/Turtle Bay (1):** Art and Design High School
- ▶ **Greenwich Village/Fin. District (2):** Chelsea CTE, UA New York Harbor School

Staten Island (1)

- ▶ **North Shore (1):** Ralph McKee

Brooklyn (8)

- ▶ **Wburg/Greenpoint (1):** Automotive
- ▶ **Brooklyn Heights/Ft. Greene (1):** George Westinghouse
- ▶ **E. New York/Starrett City (3):** Transit Tech, Maxwell, Academy of Innovative Technology
- ▶ **S. Crown Heights (1):** Clara Barton
- ▶ **Sheepshead Bay/Gravesend (1):** William E. Grady
- ▶ **Flatlands/Canarsie (1):** High School for Innovation in Advertising and Media

Endnotes

1. Community Service Society uses the term Latino to refer to students identified as Hispanic by the New York City Department of Education.
2. We compare graduation rates using a similar standard across CTE and non-CTE schools. In order to graduate, all students must obtain 44 credits and a score of 65 on five specific Regents exams. Of the 44 required credits, 37 must be in specific subjects that meet the same standards across CTE and non-CTE schools. Only seven elective credits—which can differ across schools—can count toward graduation requirements.
3. This report uses the NYCDOE’s “Aspirational Performance Metric” (APM), to denote college readiness, which requires that students achieve scores of 75 and 80 on their English and Math Regents exams, respectively, rather than the score of 65 on each exam that are required to graduate.
4. The Perkins Act is currently up for reauthorization. In 2012, the United States Department of Education released a reauthorization blueprint calling for updates and reforms to the Perkins Act. That can be found at: <http://www2.ed.gov/about/offices/list/ovae/pi/cte/transforming-career-technical-education.pdf>
5. The Association for Career and Technical Education offers a deeper explanation of CTE: <https://www.acteonline.org/general.aspx?id=120#Uo5WbdKkpgk>
6. In 2013, NYCDOE opened two CTE schools replicating the P-TECH model, and three more are slated to open in September 2014.
7. Results from the 2004 Unheard Third Survey, an annual survey of New York City residents designed by Community Service Society in collaboration with Lake Research Partners.
8. Results from the 2013 Unheard Third survey.
9. Career Academies are small learning communities that operate as a single program or as multiple programs within a larger high school, and serve between 150 and 200 students from grades 9 or 10 through grades 12. There are an estimated 2,500 Career Academies across the country.
10. James J. Kemple. “Career Academies: Long Term Impacts on Labor Market Outcomes, Educational Attainment, and Transitions to Adulthood.” June 2008. MDRC.
11. Based on conversations with David Fischer, Senior Director for Career and Technical Education, New York City Department of Education
12. <http://schools.nyc.gov/ChoicesEnrollment/CTE/ParentsandStudents/default.htm>
13. “Mayoral Task Force on Career & Technical Education Innovation: Preliminary Recommendations – June 2008.” Available at <http://schools.nyc.gov/NR/rdonlyres/B881BA2E-4D18-4BB1-9797-C0DA072128D2/145079/CTETaskForcePreliminaryRecommendations61108.pdf>
14. Ursulina Ramirez and Edith Anne Sharp. “Path to the Future: Strengthening Career and Technical Education to Prepare Today’s Students for the Jobs of Tomorrow.” January 2012. Office of Bill de Blasio, Public Advocate for the City of New York. Available at <http://www.advocate.nyc.gov/sites/advocate.nyc.gov/files/deBlasio-CTE-Report.pdf>
15. Our analysis includes all students who enrolled in CTE schools in 2008, whether or not they were in a CTE school in 2012.
16. 8th grade tests for this cohort were given in 2007–08, and do not reflect the large shifts in scores since the implementation of Common Core standards in 2012–13.
17. Level 1, Scores from 1.00-1.99: Students performing at this level are well below proficient in standards for their grade and demonstrate limited knowledge, skills, and practices. Level 2, Scores from 2.00-2.99: Students performing at this level are below proficient in standards for their grade and demonstrate partial knowledge, skills, and practices. Level 3, Scores from 3.00-3.99: Students performing at this level are proficient in standards for their grade. They demonstrate sufficient knowledge, skills, and practices. Level 4: Scores from 4.0-4.99: Students performing at this level excel in standards for their grade. They demonstrate more-than-sufficient knowledge, skills, and practices.
18. In the data provided to us by the NYCDOE, there was data for 8th grade ELA scores for 59,876 students and data for 8th grade math scores for 61,156 students (out of 79,705 in the cohort). According to the DOE, the actual distribution of scores is as follows: ELA Level 1: 7.5% Level 2: 49.5% Level 3: 40.1% Level 4: 2.9% Math Level 1: 10.3% Level 2: 30.1% Level 3: 46.3% Level 4: 13.4%
19. Blacks are as likely to get their first choice school as the overall population. Latinos are more likely than any other group to be placed in their top choice school. Blacks and Latinos are both slightly more likely to be placed in one of their top three choices than whites or Asians (this mainly comes from students who were finalized to non-CTE schools.)
20. Students achieve a Regents diploma by attaining 44 credits and passing five required Regents examinations with a score of 65 or higher. CTE students must fulfill the same graduation requirements for a Regents diploma as non-CTE students. Those that complete a CTE sequence in an approved program and earn an endorsement to the CTE diploma will have taken an additional 7 to 16 credits, plus earned the industry credential. In 2012, roughly 2,500 CTE-endorsed Regents diplomas were awarded.
21. There is a very small number of students in our analysis who graduated with a local diploma—since 2012, local diplomas were only available for students with special education designations.
22. Based on analysis of New York City Department of Education 2011-2012 Progress Reports. Available at <http://schools.nyc.gov/Accountability/tools/report/default.htm>
23. Logistic (or logit) regressions are a nonlinear regression model in which the dependent variable (in this case, graduation) is binary. Logit models estimate the probability of the dependent variable being 1.
24. The NYCDOE has cited a college readiness figure of 32 percent for the 2012 cohort—that figure refers to the percentage of graduates, not all students.
25. The variables that make up the peer index are 8th grade test scores, percentages of students with disabilities or special education assignments, and the percentage of students who are “overage,” in that they have not acquired the number of high school credits since the time they began high school that would put them on track to graduate in four years. The high school peer index is a value from 1–4.50, calculated using the following formula: (Average 8th grade English and Math Proficiency) – (2 x % students with disabilities) – (2 x % students in self-contained settings) – (% students overage) = Peer Index Score
26. The DOE creates peer groups of up to 40 schools that are closest in peer index score to compare schools. For simplicity, we have created our own peer groups using those schools with the closest peer index score to each of the CTE schools. Our groups contain between 10-20 schools.

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