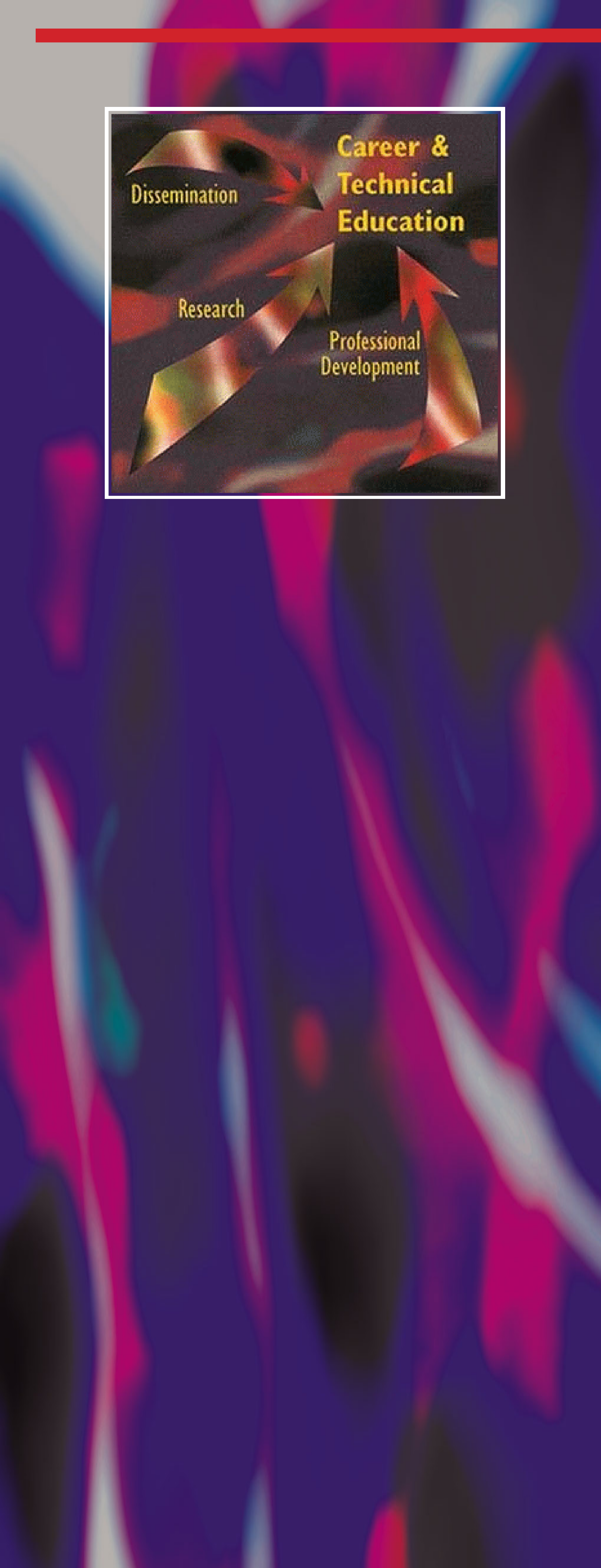

Career-Based Comprehensive School Reform: *Serving Disadvantaged Youth in Minority Communities*

National Research Center for
Career and Technical Education

UNIVERSITY OF MINNESOTA

CAREER-BASED COMPREHENSIVE SCHOOL REFORM: SERVING DISADVANTAGED YOUTH IN MINORITY COMMUNITIES

Marisa Castellano
University of Louisville

James R. Stone III
University of Minnesota

Sam Stringfield
University of Louisville

Elizabeth N. Farley-Ripple
University of Pennsylvania

Laura T. Overman
Roshan Hussain
University of Louisville

National Research Center for Career and Technical Education
University of Minnesota

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ABSTRACT

This report presents the results of a five-year longitudinal study designed to examine the effect of career-based comprehensive school reform on creating a successful high school experience and preparing youth for the adult world of postsecondary education and work. The study included three feeder patterns of middle schools, high schools, and community colleges in communities with high percentages of at-risk students. The high schools implemented career-based comprehensive school reform to try to improve the educational chances of the poor and minority students they served. Comparison high schools with similar student populations but not undergoing comprehensive school reform efforts were found.

High school engagement and achievement were measured using attendance, dropout, course-taking, and graduation data. High school transition was measured using responses to a senior survey, participation in Tech Prep and dual credit opportunities, and achievement data for the graduates who attended their local community college. All measures were compared to the comparison school students.

The outcomes were mixed. None of the three schools achieved consistent gains over their respective comparison group on measures of academic achievement. However, one finding held true across all six high schools: The odds of dropping out declined as the proportion of the high school experience invested in CTE courses increased. In terms of transition to postsecondary, more students reported having a post-high school plan than their comparison school counterparts at two of the three study schools. Many students at the study schools aligned their next step with their high school course of study. Finally, most of the students who attended their local community college needed to take remedial coursework. The implications of these findings are discussed.

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EXECUTIVE SUMMARY

Introduction and Conceptual Model

Like many researchers, practitioners, and policymakers, we were interested in finding replicable models of successful high school reform structures that encourage students—especially those at risk of not completing high school—to achieve academically and to internalize the advantages of continuing their education or training beyond high school. Given the perspectives that we brought to the issue, we hypothesized that incorporating career and technical education (CTE) as a major component of that reform structure could improve student engagement, which is a precursor to student achievement in and transition from high school. The conceptual model that we developed drew upon previous strands of research outlining promising components and practices of high school reform: comprehensive school reform, CTE, and credit-based transition opportunities such as Tech Prep or dual credit.

We selected high schools that were implementing career-based comprehensive school reform; that is, they were attempting to blend comprehensive school reform with elements of CTE or career themes to increase their students' engagement, achievement, and transition from high school. The particular constellation of components and practices at each of the high schools constitutes its reform structure. Other elements besides the reform structure contribute to student outcomes. For example, district, state, and federal mandates affect student outcomes, and student background characteristics obviously play a role as well. The characteristics taken into account in the analyses for this study include student background (i.e., gender, race, ethnicity, English proficiency, special education status, and poverty status). The reform structure, the larger policy context, and student characteristics all affect student behaviors (i.e., course taking, attendance) and student intentions (i.e., whether to attend college or work after high school). Together, these elements result in certain student outcomes at both the high school and community college levels.

Sample

Three study sites were identified and selected through a multi-stage sampling process. We selected high schools that were implementing career-based comprehensive school reform and that: (a) served a majority of students from low-income and racial/ethnic minority backgrounds, (b) provided exemplary CTE with well-documented records of substantial improvements in student outcomes, and (c) collaborated across middle school, high school, and community college levels. High schools that satisfied these criteria were asked to nominate possible comparison high schools located near them that served similar students but were not involved in such reform efforts.

Academy High School (AHS) is located in a large urban center in the West. AHS was divided into three career academies. As an Urban Learning Center, AHS was co-located in a single facility with an elementary school and a middle school. Only students from Academy Middle School could apply to AHS, and they were selected using a lottery process. This provided an opportunity to create a de facto random assignment design at this site, since many of the students who were not selected to attend AHS subsequently attended the comparison school, C-AHS.

Pathways High School (PHS) is located in an agricultural area in the Pacific Northwest. PHS implemented career pathways across the curriculum. PHS students interested in specialized CTE instruction could attend a regional vocational skills center that served several small districts. C-PHS, the comparison school, was also a comprehensive high school that sent students to a regional skills center, and we collected data on both groups of students at these skills centers.

Vocational High School (VHS) is located in a small city in the Northeast. VHS was one of four high schools in this district. Three of the high schools were college preparatory in nature, including C-VHS, the comparison school. VHS was the district's vocational technical high school. It had adopted High Schools That Work (HSTW) to improve student academic performance. Over the years, VHS had gained a reputation as the appropriate destination for lower-achieving and special needs students. Despite its widely acknowledged status as the district dumping ground, VHS also attracted motivated students who were interested in the concentrated CTE programs offered there.

Quantitative Methods

Quantitative analyses examined the relationships between the types of reforms implemented at the sites and student engagement, achievement, and transition to postsecondary. We sought to understand the school effect and, independent of school attended, the effect of taking CTE courses on these measures. Other independent effects examined included student background characteristics.

Student engagement was defined in this study as attendance and (not) dropping out of high school. Attendance measures were drawn from systems records. Students who were coded as dropout (or in some cases, unknown) in the district data were considered dropouts.

To determine the CTE effect on dropping out, we used a CTE/total course ratio approach as a predictor of dropping out of high school. We examined CTE as a proportion of the high school experience or as a ratio, and we included dropouts in the analysis. The CTE effect on dropout was analyzed by estimating a competing-risk hazard model. Here, the term "hazard" means the probability that a student either dropped out or persisted during a particular semester, given that the student had not dropped out or graduated before that semester. It is a "competing-risk" model because there were two possible outcomes—dropping out or persisting (where graduating was the final form of persisting)—rather than just one. In these analyses, we controlled for school attended.

Student achievement was defined in this study as progress toward graduation and successfully completing high school on time. Progress toward graduation was a count of credits earned drawn from student transcripts. We focused on mathematics, science, and CTE credits in these analyses. For graduation, we used systems designators that indicated that the student had graduated.

Our analyses of transition used measures from: (a) senior “next step” surveys to examine postsecondary aspirations, (b) high school records on credit-based transition opportunities such as Tech Prep and dual credit, and (c) achievement data collected at the local community colleges to examine acceptance to a postsecondary institution, student need for remediation in college, and postsecondary credits earned after high school graduation. Data on students who attended other colleges or who entered the workforce directly after high school were not collected as part of this study.

Qualitative Methods

We created case studies of the three study high schools, making annual site visits to each over a four-year period, beginning in 2000 and ending in 2004. We conducted individual interviews and focus groups with stakeholders (teachers, students, and administrators) at all of the study schools. All of the interviews were taped and transcribed. The transcripts were then classified by type (e.g., CTE teachers, students). Following case study methods, the transcripts were coded and entered into a qualitative data analysis software package.

During the four years of site visits, the research team also observed classes. We employed a three-part observation protocol, spanning the range from low-inference data collection to ethnographic observations. Two parts of the observation protocol could be coded and entered into the data analysis software package. When codes were queried during data analysis, results came from both interview and classroom observation data. The third element of the classroom observation protocol was analyzed to produce means and frequencies and to perform chi-square tests. Using these multiple sources of data allowed us to triangulate findings. Results from the individual sites follow.

AHS Outcomes

Measures of student engagement and achievement were either equal at both schools or higher at AHS than C-AHS. Attendance at AHS was better than at C-AHS. One explanation for the higher attendance at AHS could be the career academy structure, designed to keep students engaged. Career academies provide students with a high school experience characterized by (a) a core group of teachers dedicated to the academy, (b) scheduling that keeps students in a cohort, (c) classrooms and resources available exclusively for academy students, and (d) connections between the school and a career area that students themselves have selected.

There was no difference between the schools in the likelihood of dropping out. Regardless of high school attended, taking a higher ratio of CTE classes to academic classes reduced the risk of dropping out.

In terms of achievement, AHS students earned more math credits than C-AHS students. There was no difference in the odds of a student from either school earning credits in Algebra or higher, but the odds of earning high-level math credits were higher at AHS. While this seems contradictory at first, it should be noted that all AHS students attended AMS, and the comparison group for AHS is comprised of those C-AHS students who also attended AMS. Since most AMS students take Algebra in the 8th grade, we would not expect a large difference in the number of students from either high school group who have taken Algebra. But when the category becomes "high-level math," which is defined as Algebra 2 or higher, that is more likely to distinguish between the AHS and the C-AHS high school experience. We had hypothesized that AHS students would go farther in the math sequence, and this was indeed borne out.

Data from the classroom observations confirmed that the academic press on AHS students in the math classes was strong. Students paid close attention during their math class, and teachers were prepared with work that appeared to challenge them. AHS students had higher attention rates in math classes than during any other type of class observed. Other elements of the classroom observations revealed that there was significantly more student feedback, more instances of "teacher acting as coach," and more challenging activities in math classes than in any of the other classes at AHS.

There was no difference in the number of science credits earned at either schools. Students at AHS earned more CTE credits than their counterparts at C-AHS. There was no difference in the likelihood of a student from either school graduating on time.

In terms of student transition, more students had a post-high school plan at AHS than at C-AHS, and more AHS students reported being accepted to college. More AHS students than C-AHS students participated in dual credit opportunities.

The analyses of community college data revealed that AHS graduates earned more credits than C-AHS graduates. There was no difference in the cumulative GPA of the two groups. Given the explicit goal at AHS, which is to send its inner city students to four-year universities, it is possible that the stronger AHS students indeed attended those universities, and this group that attended Academy Community College (ACC) showed fewer differences in achievement at the college compared to C-AHS students. These students self-identified as having lower GPAs than their peers, being less sure of their goals, and lacking the financial resources to attend four-year universities. Therefore they may not be as representative of the entire AHS cohort as the 63% who planned to attend four-year universities.

Despite the strong academic preparation at AHS, AHS graduates needed remediation at the same rates as C-AHS graduates. Some AHS graduates admitted that they had not taken the ACC academic placement tests seriously. One student also reported that he had not taken math during his senior year and had forgotten "everything." This student reminds us that the traditional math sequence beginning with Algebra is being introduced at younger grades. This means that when students take community college placement tests, which tend to be Algebra-based, many students have not had Algebra for four years. Even students who take math during their senior year might not receive enough practice in the relevant Algebraic procedures to perform well on an Algebra-based test.

PHS Outcomes

Student engagement and achievement were lower at PHS than at its comparison school. C-PHS students equaled or outperformed PHS students on every measure: PHS students earned fewer science credits and had a higher risk of dropping out (although taking a higher ratio of CTE classes to academic classes reduced the risk of dropping out, regardless of high school attended). There were no significant differences between the groups in their attendance rates, math credits earned, or likelihood of earning CTE credits. Our observations of math classes also revealed a mixed picture: students appeared to pay less attention in math class than in all other classes, but challenging activities and student engagement in relevant dialogue were more common in math than in other classes. The CTE classroom observation data suggest that students were very engaged in their CTE classes. Our observations point to certain pedagogical practices that were significantly more prevalent in CTE classes than academic classes—such as significantly more independent work, more use of computers, and more hands-on learning than non-CTE classes—and these practices might also have contributed to the high levels of student engagement in CTE classes.

PHS students were found to be less likely to graduate on time than C-PHS students. We had hypothesized that PHS would have higher graduation rates than high schools that had not implemented career pathways. The assumption was that career pathways were a means of organizing high school that helped all students understand the importance of finishing school, regardless of their anticipated career trajectory. However, PHS students' lax attitudes about attending and finishing high school led to significant failure to graduate rates that career pathways did not appear to be reducing.

The results at this site ran counter to our expectations. Perhaps career pathways as this school operationalized them did not help students succeed academically or see the value of education for their future. It appeared as though the career pathways curriculum delivery model had not improved student graduation rates. Meanwhile, state accountability requirements were increasing, which led some PHS administrators to call for changes to career pathways, including larger blocks of time to prepare for the state tests in math and English.

Despite disappointing high school outcomes, and in keeping with the very mixed nature of the study results, PHS graduates outperformed their C-PHS counterparts on many measures of student transition to postsecondary education. More students had a post-high school plan at PHS than at C-PHS, and equal numbers were accepted to four-year universities. More PHS students participated in Tech Prep than did C-PHS students, and students at both schools earned large numbers of college credits through their dual credit programs.

At the end of one year of college, PHS students had earned significantly more credits than C-PHS students. The remediation results were particularly striking: for each academic subject, far fewer PHS than C-PHS students were required to take a remedial course.

The results for Latinos at PHS merit further discussion, especially at graduation and beyond. Latino students at PHS were significantly less likely to graduate than White students. The senior survey data tell us that Latino students were only about half as likely to report being accepted to college as White students. The Pathways Community College (PCC) data show that 64% of the PHS graduates who attended PCC that year were White, while only 28% were Latino.

The remediation data from PCC showed that Latinos were significantly more likely to need remediation at PCC than students from other backgrounds. Unfortunately, prior achievement scores were not available at this site, limiting our ability to explain the results. Career pathways at PHS had not improved student achievement or retention, especially for its large Latino population.

VHS Outcomes

Student engagement and achievement were generally low at VHS. Chronic absenteeism was a large problem there. Of all the high school measures we examined, VHS outperformed its comparison school only in promotion rates from sophomore to junior year and in CTE credits earned. One reason for these outcomes, of course, is that C-VHS is a college preparatory high school. One would not expect a vocational high school to outperform a college preparatory high school on academic measures. Many VHS stakeholders agreed on the main reasons for students' poor academic performance: past social promotion, chronic absenteeism, and low levels of literacy.

Classroom observation data showed that students were not significantly more engaged in CTE classes than in their academic classes. Given that this was a vocational high school that students knowingly chose, it was somewhat surprising to find such low attention rates in CTE classes. We did not observe any CTE classes where the local labor market was a topic of class discussion. There was no mention made of the ways in which the skills being taught were used in workplaces. Additionally, none of the CTE classroom observations reported students doing any math, a subject with applications in most if not all CTE programs.

VHS had seemed to be on the cusp of academic improvement when the study began: the school environment had been cleaned up for student learning, HSTW had been adopted for several years, the staff seemed energized by integrated projects with purpose and value outside of the school, and the programs implemented to bring students up to grade level seemed well-thought-out. But VHS had an appointment with destiny. Its state test scores were among the lowest in the state, and had not improved over the early years of the administration of the exam.

Despite all attempts at improvement, student test scores remained low, and VHS was declared a school in crisis by the state department of education. There were many changes at VHS following the in-crisis declaration. One casualty was the HSTW reform. In a troubled context like this, any reform effort would have had a hard time taking hold and showing results. But even before the declaration, HSTW had not engaged enough staff to achieve a critical mass for change. There were long-standing divisions between teachers at VHS. Even among HSTW supporters, after the in-crisis declaration, HSTW was not seen as a means of accomplishing their goals, but as an extravagance.

The interesting story at VHS, however, is the number of measures for which there was no difference between VHS and C-VHS outcomes. There were no significant differences in measures of attendance, in two of three years of promotion progress, in math credits earned, and in the odds of graduating from either school. These results are a testament to the hard work of the VHS teachers and administrators. Incoming students performed well below grade level, and often arrived with behavioral and attitudinal problems. That the VHS staff could take such a group and have them match the college preparatory high school in promotion progress and math credits earned in Algebra or higher is a positive outcome.

The odds of dropping out were much higher at VHS than at C-VHS. However, regardless of high school attended, taking a higher ratio of CTE classes to academic classes reduced the risk of dropping out.

The analyses of two years of community college data did not reveal many significant differences between VHS graduates and the C-VHS graduates. Almost all of them needed some form of remediation, usually mathematics. Although they earned similar numbers of credits, C-VHS graduates earned a higher cumulative GPA than VHS students.

Cross-Case Findings

The results of this study were complex, and some ran counter to our expectations. None of the three study schools achieved consistent gains over their respective comparison school on measures of academic achievement. However, one finding held true across all six high schools: The odds of dropping out declined as the proportion of the high school experience invested in CTE courses increased. Independent of the school effect, we examined a CTE coursework effect, and found this to be a significant negative predictor of dropout regardless of high school attended.

In terms of transition to postsecondary, more students reported having a post-high school plan than their comparison school counterparts at two of the three study schools. Many students at the study schools aligned their next step with their high school course of study. In six measures of alignment, the percentage of students who remained in their high school course of study ranged from 41% to 62%. This supports the purpose of many career-based reforms: to provide students with opportunities to explore careers without sacrificing the opportunity to attend college or pursue other options. The career-based courses of study provided greater coherence to these students' high school experiences. This coherence in school can help students feel some control over at least one aspect of the turbulent period of life called adolescence. The courses of study provided ways for novice students to develop competence in an area of interest to them, while still in a relatively safe environment. The students in this study benefited from thinking seriously and making some decisions about their future while still in high school. Student interviews confirmed this, regardless of whether they felt they would choose the same course of study if given the choice again.

In terms of the community college analyses, we found that regardless of the level of high school academic press, the majority of students who attended their local community college needed to take remedial coursework in order to begin taking college-level courses. Only PHS graduates who attended PCC outperformed their comparison group counterparts. However, PHS graduates still needed remediation at the rate of 60% of those attending PCC.

Conclusion

Overall, we concluded that although career-based comprehensive school reform may not have increased student achievement in this population, neither did it decrease it. However, there were large changes to the educational landscape during the study, the largest of which was at the state and federal levels, where accountability achieved unprecedented prominence. Looking back from this vantage point, and seeing the current progress that states are making in developing standards systems for CTE, it seems that we were ahead of our time, thinking that we would see improvement in student achievement at high schools with career-based reforms. We began the study at a time when there was not the same level of attention to the mission and potential of CTE. What we saw instead over the course of the study was the turmoil that takes place during a change period, as academic standards were being mandated at all three schools, but CTE program areas had not yet had a chance to respond. Academic standards placed much pressure on CTE, and we witnessed the throes of change as schools tried to respond to the higher expectations brought about by *No Child Left Behind*, a law that was not even being considered when we began this study.

Therefore the conclusion we draw from this study is that we found rather neutral effects of career-based comprehensive reform efforts on the engagement, achievement, and transition of students from minority or high-poverty backgrounds. But given the dramatic changes that have taken place since this study began, we believe that similar studies in the future could yield more positive results.

CHAPTER 1: CONCEPTUALIZING AND STUDYING CAREER-BASED COMPREHENSIVE SCHOOL REFORM

Like many researchers, practitioners, and policymakers, we were interested in finding replicable models of successful high school reform structures that encourage students—especially those at risk of not completing high school—to achieve academically and to internalize the advantages of continuing their education or training beyond high school. Given the perspectives that we brought to the issue, we hypothesized that incorporating career and technical education (CTE) as a major component of that reform structure could improve student engagement, which is a precursor to student achievement in and transition from high school. The conceptual model that we developed drew upon previous strands of research outlining promising components and practices of high school reform: comprehensive school reform (in general and from specific reform designs), CTE (e.g., integrated curriculum, SCANS workplace readiness skills), and other options facilitating postsecondary transition (e.g., Tech Prep, dual credit).

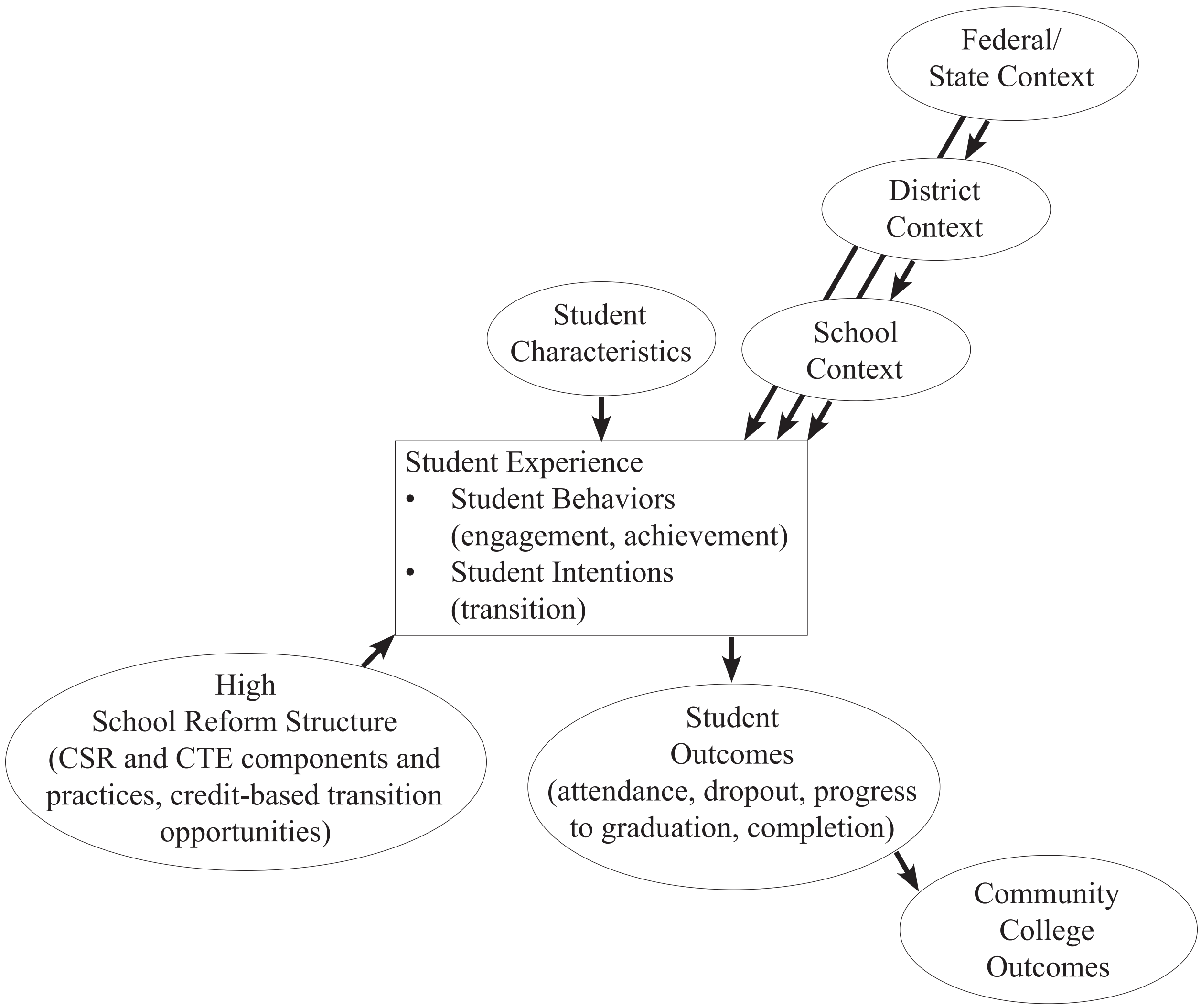
For this study, we sought high schools implementing career-based comprehensive school reform; that is, schools attempting to blend comprehensive school reform with elements of CTE to increase their students' engagement, achievement, and transition. The particular constellation of components and practices at each of the high schools we ultimately selected—their reform structure—constitutes that element of the model that we were testing (see Figure 1). As can be seen in the model, other elements besides the reform structure contribute to student outcomes. Independent of the type of reform structure, district, state, and federal mandates affect student outcomes. Student characteristics obviously play a role as well. The characteristics taken into account in the analyses for this study include demographic variables such as gender, ethnicity, English proficiency, special education status, and poverty status.

The reform structure, the policy context, and student characteristics all affect student behaviors (i.e., course taking, attendance) and student intentions (i.e., whether to attend college or work after high school). Together, these elements result in certain student outcomes at both the high school and community college levels. The rest of this chapter discusses the elements of the model. Where possible, we have reviewed literature on the interaction between CTE and any of these elements (i.e., when we review the dropout literature, we include any relationship found between CTE and dropping out). This is because in addition to looking for school effects, we also sought other explanatory effects independent of school, such as the interaction of CTE coursework with student outcomes.

High School Reform Components and Practices

The components and practices of successful high schools reviewed here come mainly from two heretofore separate streams of curriculum and pedagogy in U.S. high schools: academic education and vocational education, the latter now called CTE. Successful components and practices in academic education have often been included in comprehensive school reform designs.

Figure 1
Career-based comprehensive school reform: Conceptual model



Comprehensive Secondary School Reform Components and Practices

Improving academic achievement has been the impetus for the school reform efforts of the past two decades. The history of U.S. education is one of nearly continuous attempts at educational reform (Tyack, 1974). Yet careful historical scholarship (Cuban, 1993) and the best available quantitative data on secondary student achievement (Campbell, Hombo, & Mazzeo, 2000; U.S. Department of Education, 2005a) leave the disquieting impression that a great deal more has been tried than has succeeded. After reviewing the five largest U.S. school change studies of the 20th century,[1] Nunnery (1998) found that locally-developed reform efforts rarely

1 The Eight-Year Study of the 1930's (Aiken, 1942); the Follow Through Classroom Observation Evaluation (Stallings & Kaskowitz, 1974); Federal Programs Supporting Educational Change, or "The RAND Change Agent Study" (Berman & McLaughlin, 1978); Dissemination Efforts Supporting School

moved to actual classroom implementation, despite having begun with high hopes and a flurry of committee and design work.

Given the difficulty of implementing locally-developed reforms, and spurred in part by federal funding for comprehensive school reform (CSR) implementation, many schools have adopted externally-developed CSR designs. Universities, foundations, and for-profit and non-profit companies have developed and are delivering CSR designs to schools across the country. Schools adopt the designs more or less completely, but the school change process inevitably involves a certain amount of co-construction, in which schools adapt and modify these designs to fit their unique contexts and missions (Datnow, Hubbard, & Mehan, 2002). However, schools that modify designs excessively are considered poor implementers by the parent organizations, and extreme adaptations can cause schools to lose their affiliations with their CSR designs. Furthermore, a variety of studies over more than 50 years have noted a positive correlation between fidelity of reform design implementation and the improvement of student outcomes (Aiken, 1942; Stallings & Kaskowitz, 1974; Stringfield et al., 1997).

CSR designs vary in the extent of change recommended. Some designs focus exclusively on changing organizational cultures and structures and do not provide specific curricular or instructional recommendations. However, designs that recommend examination of all aspects of a school—from governance to professional development to curriculum and instruction—have a better chance of succeeding (Nunnery, 1998). In addition, the comprehensive approach is more likely to involve the CTE departments of a high school.

Among those designs that include curriculum and instruction as integral parts of the reform, most converge around certain pedagogical tenets. One synthesis of these tenets laid out principles for successful school restructuring (Newmann & Wehlage, 1995). These authors emphasized the importance of authenticity in successful teaching and learning. Authentic achievement involves students participating in disciplined inquiry that leads to student construction of knowledge—their own synthesis of what they have learned. Such student work ideally should have value outside the classroom, such as papers or projects that communicate ideas or present solutions to issues. Newmann and Wehlage also advocated for an authentic pedagogy, which includes promoting higher-order thinking, dialogue that produces complex understandings, and helping students connect substantive, academic knowledge with current events, personal experience, or background.

Tharp's (1997) principles for effective classroom instruction are similar. Tharp called for teachers to engage students in more complex levels of understanding: (a) facilitating learning through joint productive activity between teachers and students, (b) developing competence in the language and literacy of instruction throughout all instructional activities, (c) contextualizing teaching and curriculum in the experiences and skills of home and community, (d) challenging students toward cognitive complexity, and (e) engaging students through dialogue.

Improvement, or DESSI (Crandall et al., 1982); and the Special Strategies Studies for Educating Disadvantaged Children (Stringfield et al., 1997).

In addition to these tenets, many CSR designs call for raising expectations of students, and providing students various ways of demonstrating their mastery of material through alternative, performance-based assessment practices such as portfolios and senior projects (American Youth Policy Forum, 2000; High Schools That Work, 2006; National Association of Secondary School Principals [NASSP], 1996; National Clearinghouse for Comprehensive School Reform, 2004).

There have been several published efforts to review the full range of CSR studies, the most recent and comprehensive of which was a meta-analysis conducted by Borman, Hewes, Overman, and Brown (2003) which examined 232 studies of 29 different CSR designs. Borman et al. reached generally positive conclusions regarding CSR, finding a mean positive effect size of +.15.

Of particular interest to this study are the high school reform designs that were being implemented by the study high schools. The first, Urban Learning Centers, began in 1992, and has been implemented in various high-poverty areas since that time. The second, High Schools that Work, began in 1987 as an initiative of the Southern Regional Education Board. It has since grown to include more than 1,200 schools in 32 states (Bottoms, 2006). The third site implemented a model based on career pathways that was not reviewed by Borman et al. (2003).

Urban Learning Centers

Urban Learning Centers (ULC) is a K-12 reform design that creates articulated communities across all grade levels, usually housed in one facility. A description of the initial design was written by Johnson and McDonald (1996). ULC is comprised of three main components:

1) teaching and learning, including integrating high standards into a thematic, interdisciplinary curriculum, experiential learning, and multi-age classrooms;
2) governance and management, meaning that all staff and school stakeholders are empowered to collaborate in the decision-making process; and
3) learning supports, such as health services, social services, and on-site parent education.

Fully 98% of the first graduating class of the first two ULCs, schools in troubled urban areas, applied and were accepted to postsecondary institutions—a huge increase over these schools' previous numbers (Aschbacher & Rector, 1995). This suggests that the design can have an effect on student outcomes in such contexts. Some studies have been conducted of the ULC implementation process (Brock & Groth, 2003); however, rigorous outcome studies remain to be conducted.

High Schools That Work

High Schools That Work (HSTW) attempts to "raise the academic achievement of career-bound high school students by combining the content of traditional college preparatory studies (e.g., English, mathematics, science) with vocational studies" (Herman et al., 1999, p. 76). This is accomplished through a curriculum that includes rigorous vocational courses along with increased academic coursework.

HSTW calls for common planning time for teachers to collaborate on curriculum integration, and it sets higher standards and expectations for all students (Bottoms & Presson, 1995). Extra help is provided for students, along with an individualized advising system. HSTW uses assessment information to improve student learning. All high school seniors who complete a vocational or technical concentration at HSTW sites are required to participate in the HSTW Assessment, which is based on the NAEP tests of reading, mathematics, and science.

Research has shown that "HSTW students, including vocational students, take more academic courses than [other] students at the same schools did" before HSTW was implemented (Herman et al., 1999, p. 77). Schools that have implemented the design faithfully usually see improved student achievement and higher attendance, graduation, retention, and postsecondary attendance rates (NWREL, 1999). Studies also show schoolwide improvement over time on the HSTW Assessment (Frome, 2001; Kaufman, Bradby, & Teitelbaum, 2000; NWREL, 1999). However, students who do not complete the HSTW-defined vocational concentrations do not take the HSTW Assessment, a fact that affects overall test scores. Borman et al. (2003) found that many one-group pre-post evaluations produced positive effects. Thus, while it can be shown that certain indicators of student success are improving at HSTW high schools, this research design cannot show that such indicators are not also improving at other schools. In short, more rigorous studies of HSTW using control groups are needed.

CTE Components and Practices

The value of CTE in the overall high school experience has long been debated. Federal legislation, technological changes in the workplace, and the secondary school reform movement have all led to an evolution in CTE away from job-specific training and toward programs requiring strong academic foundations and broader skill sets (Castellano, Stringfield, & Stone, 2003).

In the wake of *No Child Left Behind*, the debate over CTE has sharpened to focus on how CTE supports the Act's goals of increasing academic achievement and closing the achievement gap. Given this fundamental shift in goals, the CTE research base has not kept pace with that of other educational program areas. Many aspects of CTE lack the rigorous examination that comprehensive school reform components and practices have enjoyed. The CTE components and practices reviewed here include longstanding elements such as work-based learning, as well as new concepts and structures: integrated curriculum, incorporating the SCANS skills, career academies, and career pathways.

Work-Based Learning

Cooperative education, or co-op (Stern, Finkelstein, Urquiola, & Cagampang, 1997), school-based enterprises (SBE; Stern, Stone, Hopkins, McMillion, & Crain, 1994), and youth apprenticeships (Hamilton, 1990) are common ways of providing students work-based learning opportunities. In co-op programs, students receive training in the context of a paid job. In SBEs, students are involved in either on-site or off-site work-related experiences such as running a store, producing goods or services for sale, or even building a house. Students enroll in related classes (e.g., business management or construction) and may decide how to re-invest the income generated by these enterprises, but usually they are not paid for SBE work. Compared with outside jobs, effective SBEs often provide more opportunities for students to perform a range of tasks and work in teams. Youth apprenticeships offer opportunities for students to learn and be paid at the same time; in these, "schools provide integrated academic and vocational education that is linked to employer-provided paid work experience and training at a work site" (Corson & Silverberg, 1994, cited in Urquiola et al., 1997, p. 120).

Work-based learning programs such as co-op, SBEs, and youth apprenticeships are important means of engaging young people in school because most high school students want or need to work. Part-time work of less than 20 hours per week can have positive effects on students (Stone & Mortimer, 1998; Warren, LePore, & Mare, 2000). In addition, when work-related experiences are coordinated with school learning, students have the opportunity to learn from and contribute to authentic achievements in a work setting while earning money.

Pauly, Kopp, and Haimson (1994) found that work-based learning experiences engaged students who were at risk of dropping out of school. One of the most important recommendations of the study was to begin these programs early. Work-based learning programs that started before 11th grade were more likely to succeed in keeping young people engaged in high school, simply because more students were still in school. Many students begin to disengage from school as early as the middle school years (Finn, 1989), so beginning a program in 9th or 10th grade provides more disaffected students a reason to stay in school.

Integrated Curriculum

Federal legislation that funds CTE is re-authorized approximately every five years by the U.S. Congress. The *Carl D. Perkins Vocational and Applied Technology Education Act of 1990* (known as Perkins II) was the first to call for the integration of CTE and academic curriculum, but defined integrated curriculum only as sets of courses comprising coherent sequences through which students could achieve both academic and vocational competencies. Details were left to states and localities.

The concept of integrated curriculum is based on the same ideas that Newmann and Wehlage (1995) utilized above in their exhortation to educators to contextualize learning and engage learners. One context that engages many students is that of the workplace. Decades of research in cognitive science suggests that students learn better when learning is modeled after "real-world" learning outside school (Lave, 1988; National Research Council, 1999; Resnick, 1987). Resnick contrasted learning in and outside school, noting that schools lacked the context for adequate engagement of tools, other artifacts, and people. For example, in school, using calculators and conferring with friends are considered cheating, not learning methods. She criticized conventional schooling for simply presenting information, to the detriment of developing higher-order cognitive abilities: thinking about the thinking and the problem solving in which one is engaged. Conversely, effective out-of-school learning settings involved learners in socially shared intellectual work, such as group projects. Such contexts contained elements of apprenticeship, by which she meant that learners at all levels participated and developed their range of knowledge and competence gradually. For schools to fulfill their mission, Resnick concluded, they must focus on the aspects of learning that occur in out-of-school learning situations and incorporate those aspects into the school curriculum.

Proponents of integrated curriculum have advocated that it could serve several important purposes (Grubb, 1995a; Rosenstock, 1991). It could reform secondary education for at-risk students, making their experience more rigorous and inclusive of the kinds of competencies historically perceived to be lacking in traditional vocational (and general) tracks. When coupled with new organizational structures (e.g., career academies, discussed below), integrated curriculum formed part of what became known as the new vocationalism (Benson, 1997; Grubb, 1995a), which referred to a broadening of the goals of CTE beyond job-specific training. Beyond that, integrated curriculum could provide the opportunity to change an entire high school. Teachers could collaborate with peers outside their discipline, and students could take engaging academic courses related to broader themes of adult life or careers. Pedagogy, too, could change, as academic courses presented students with applications of traditional bodies of knowledge and CTE teachers incorporated rigorous methods and deeper understanding of various technologies.

However, little utilization of integrated curriculum is found in the literature, and its effectiveness has therefore been difficult to assess (Johnson, Charner, & White, 2003). In studies of other reforms, a general finding has been that the less prescriptive and more vague a reform, the more difficult it is to implement (Datnow et al., 2002). This may be true of integrated curriculum, since it was purposely left vague in order to encourage innovation. A 1997 survey of comprehensive high schools (i.e., not including vocational high schools) reported that although the faculties of 90% of the high schools surveyed had attended professional development sessions on integrated curriculum, only 45% had implemented it (Levesque, Lauen, Teitelbaum, & Librera, 2000). Yet even in these schools, both academic and vocational instructors admitted confusion over when curriculum integration can be said to be in place (DeLuca, Charner, & White, 2001). The 2004 National Assessment of Vocational Education (NAVE) report concluded that although integrated curriculum remains a priority at the state level, it is neither broadly nor deeply implemented (Silverberg, Warner, Fong, & Goodwin, 2004).

SCANS Skills

A series of commission reports during the 1980s and early 1990s assailed U.S. schools for failing to sufficiently prepare young people for the workplace, and warned of the negative economic consequences of the growing educational shortcomings of young Americans (Commission on the Skills of the American Workforce, 1990; National Commission on Excellence in Education, 1983; William T. Grant Foundation, 1988). In 1990, the U.S. Secretary of Labor commissioned a report outlining the skills needed to succeed in the 21st century world of high-skill, high-wage employment. The skills outlined in this report became known as the SCANS skills

(Secretary's Commission on Achieving Necessary Skills [SCANS], 1991).

The SCANS skills comprise both a set of workplace competencies and a set of foundation skills. Among the workplace competencies, effective workers are expected to use the resources, information, and technologies at hand, as well as their systems knowledge and interpersonal skills, to get their job done efficiently. For example, they should be able to use computers to acquire, organize, interpret, and evaluate information.

In terms of foundation skills, the SCANS report cited basic academic skills such as reading, writing, and math skills as well as certain personal qualities such as punctuality and teamwork. Workers would also increasingly be asked to solve problems, make decisions, and manage their own time to a greater extent than was the case in the typical shop floor or office context of the 20th century. In order to teach such skills, the authors of the SCANS report expected traditional classrooms to change in many of the ways that the comprehensive school reform movement recommended. For example, students were expected to engage in higher-order thinking activities such as problem solving, reasoning, and decision making. Teachers and students were expected to reach out beyond the school for information (SCANS, 1991).

Murnane and Levy (1996) elaborated upon the foundation skills and personal qualities from the SCANS report listing nine "new basic skills": reliability, positive attitude, willingness to work hard, 9th-grade or higher mathematics abilities, 9th-grade or higher reading abilities, the ability to solve semi-structured problems, the ability to work in teams, the ability to make effective oral and written presentations, and the ability to use personal computers to carry out simple tasks, including word processing.

Career Academies

Career academies have existed since the 1970s, but their focus shifted in the late 1980s from a dropout prevention strategy to a high school reorganization model intended to prepare all students for both work and postsecondary education (Kemple & Snipes, 2000). Most career academies incorporate the main elements of the new vocationalism: a broad career focus, links to postsecondary education and business, and integrated curriculum (Benson, 1997). Kemple and Snipes defined a career academy as a program that (a) is organized as a school within a school, often physically separate, where students stay with a group of teachers for a period of three or four years; (b) offers students both academic and vocational curricula, usually integrated around a career theme; and (c) has established partnerships with businesses to build connections between school and work.

Early studies of career academies included an evaluation of the California Partnership Academies (Stern, Raby, & Dayton, 1992) which suggested that career academy students performed better than a comparison group on school indicators such as attendance, grades, and graduation rates. Analyses of survey data collected two years after high school did not show any significant differences between academy and comparison graduates in wages earned or likelihood of enrolling in postsecondary education.

Perhaps the most comprehensive study of career academies was the longitudinal evaluation by MDRC (Kemple, 2001, 2004; Kemple & Snipes, 2000). Researchers at MDRC began this longitudinal evaluation in 1993, with the goal of providing educators and policymakers with information on the effectiveness of career academies in the areas of (a) student engagement in and completion of high school, and (b) student transitions after high school.

An analysis of student performance in high school found that among students at high risk of dropping out, those in career academies dropped out 11% less often than did non-academy students (Kemple & Snipes, 2000). Even among students at low risk of dropping out, career academies increased their likelihood of graduating on schedule and increased their vocational course taking without reducing their completion of the academic core curriculum. Kemple and Snipes found that career academies did not improve the standardized test scores of any risk subgroup; however, they questioned whether such scores were the best measures of the kinds of learning that take place in career academies.

Kemple and Snipes (2000) recommended that career academies continue to serve a heterogeneous population of students because the mix of engaged and at-risk students may have helped to bring about the benefits for the latter group. They also stressed the importance of the interpersonal and academic supports provided by career academies, claiming that simply offering a career focus and work-based learning without such supports would not be sufficient to engage at-risk students.

Subsequent findings of the MDRC longitudinal evaluation reported on career academy students' transitions to postsecondary education and employment (Kemple, 2001), and on their labor market outcomes and educational attainment (Kemple, 2004). In the year after students' scheduled high school graduation, Kemple (2004) found virtually no difference between academy and non-academy students in rates of eventual high school graduation, college enrollment, or employment. In addition, the impact of career academies on students at high risk of dropping out of high school was less pronounced one year after graduation than it had been in high school: Students in the non-academy control group had eventually graduated from high school and enrolled in postsecondary education at about the same rates as academy students. Kemple concluded that the improvement in high school experiences for at-risk students did not translate into improved post-high school outcomes. He suggested that career academies need to provide stronger counseling and guidance, and perhaps more emphasis on academic achievement, because no impact on standardized test scores was found in this large-scale study.

The career academies in the MDRC longitudinal study showed positive labor market outcomes for male students, especially those at medium or high risk of not graduating (Kemple, 2004). Outcomes for females were not significant. For all career academy students, educational attainment was not significantly different than for students not in career academies. Kemple concluded that career academies are feasible ways of improving labor market preparation and school-to-work transition without compromising academic goals.

A study of career academies in one inner-city school district in California found that academy students were generally more successful than the non-academy students when they attended the local university (Maxwell, 2001). Academy students were found to have higher GPAs, to need less remediation in English at the university, and to graduate from the university more often than their non-academy peers. However, Maxwell concluded that the remediation rates were still too high and the postsecondary graduation rates still too low to claim that career academies were solidly successful in moving at-risk students through postsecondary education.

A final study of career academies found more positive post-high school outcomes for academy students. Orr, Hughes, and Karp (2002) studied academies that belonged to the National Academy Foundation (NAF), a national network of career academies on finance, travel and tourism, and information technology themes. As in the MDRC evaluation, Orr et al. found that students in career academies had higher-quality high school experiences, such as more computer courses, internships, and college-level courses. The researchers found that career academy alumni whose parents never went to college were attending college at higher rates than the national average of similar students. Career academy students also reported needing less remediation than average college attendees. These positive findings may be the result of self-selection bias: that is, academies may attract more able or more motivated students. The study did not adequately control for that possibility.

Career Pathways

A career cluster is "a grouping of occupations and broad industries based on commonalities" (States' Career Clusters Initiative, n.d.). Government, industry, and educators have come together to organize the U.S. labor market into 16 career clusters for education and training purposes. Within each cluster are several pathways. For example, the Health Sciences cluster includes Diagnostic Services and Therapeutic Services. Within each such pathway are specific occupations, such as a home health aide under Therapeutic Services.

However, usage of the terms *cluster* and *pathway* is not consistent across the country. Some states have developed their own clusters; others have used the same 16 and called them career majors or career pathways. Many districts and a few states have mandated that high schools incorporate these groupings, whatever they may be called, into their curriculum. Because the school in this study called them career pathways, we will use that nomenclature.

Traditionally, high schools group students together according to the perceived length of education they will ultimately experience (i.e., "college-bound"). High schools that reorganize their curricula around career pathways replace the traditional college preparatory, vocational, and general tracks with pathways such as Health Careers. These pathways provide students with a broad introduction to many occupations, such as physician or home health aide, that share similar skills and knowledge, although they may differ in the length of education and training required (Pucel, 2001).

Career pathways form the context for senior projects and other interdisciplinary activities. They are intended to provide a rigorous, coherent program of study that includes high-level academics in addition to technology applications and work-based learning. Schools that choose to develop career pathways must have strong connections with business, industry, and institutions of postsecondary education; such connections enable the school to provide internships and other applied experiences for their students. To date, no studies have been conducted on the effects of career pathways on student achievement.

Blending CSR and CTE Components and Practices

The separation of vocational and academic education seems to be a byproduct of the historically different goals and funding mechanisms of these two areas of high school curricula. As the latest wave of reform movements entered U.S. high schools, the two areas often continued to operate separately. In some cases, reform efforts served to keep academic and CTE tracks apart (Prestine, 1998). In other cases, academic and CTE areas were both involved in reform efforts, but those efforts were not directed at the entire school—students and teachers could choose between the pocket of reform within the school or the traditional high school curriculum and structure (Little, Erbstein, & Walker, 1996).

On the other hand, linking CTE and academic reforms could combine the expertise of vocational educators in career preparation and applied learning with more traditionally academic concerns, thereby making the academic curriculum more relevant and engaging and making the CTE curriculum more appealing to all students. Lessening the divisions in the curriculum and in the physical layout of the high school can also lessen the status distinction between students who consider themselves career-bound and those who consider themselves college-bound. We hypothesized that together, these two curricular areas could address the needs that all students have for a solid academic education as well as for preparation for adult life, including work.

High School Credit-Based Transition Opportunities

Other options at the high school level that help create the context for student success are those that facilitate postsecondary transition, such as Tech Prep and dual credit. The high school to postsecondary transition in the United States is not as smooth as it is in other countries (Boswell, 2001). For example, there is a disconnect between the standards and exams that students must master in order to graduate from high school on the one hand, and college admissions requirements and placement tests on the other (Education Trust, 1999). Because there is so little relation between these two educational assessment systems, students often do not use their senior year of high school to full advantage in preparing for postsecondary education. Tech Prep and dual credit are ways to instill rigor and purpose in the senior year of high school, which has become a focus of concern (Bailey, Hughes, & Mechur Karp, 2002; National Commission on the High School Senior Year, 2001). These options are described and reviewed below.

Tech Prep

The Perkins II federal legislation encouraged articulation agreements called Tech Prep between school districts and community colleges. These agreements, usually curricular in nature, link a student's CTE program of study in their final two years of high school with the first two years of postsecondary education (or apprenticeship), leading to a degree or certificate. The goal of Tech Prep was to eliminate repetition between high school and community college courses and show students a clear path to postsecondary education and technical occupations. Tech Prep also allowed community colleges to teach the more advanced courses thought to be necessary for highly technical occupations, on the assumption that students had taken foundational courses in high school.

Perkins II contained vague definitions of course articulation so as to encourage the creation of systems that responded to local needs. However, this vagueness slowed its development. An evaluation of Tech Prep implementation that surveyed state and local administrators found that only 8% of high school students participated in Tech Prep (Hershey, Silverberg, Owens, & Hulsey, 1998). This study also found that parents and students often balked at strictly defined sequences of courses explicitly intended to prepare students for community college, since such a course sequence appeared to eliminate the possibility of attending a four-year college. Once out of high school, Tech Prep students did not always take advantage of the articulated coursework by proceeding to more advanced courses at a community college. Often, students had to retake the articulated courses at the college level (Bragg, 2000; Urquiola et al., 1997).

Bragg (2000, 2001) conducted a longitudinal study of eight Tech Prep consortia that were considered "mature implementers." Because of large differences in implementation across sites, Bragg (2001) did not aggregate all results over the eight consortia but instead described the ranges of outcomes. Across consortia, 28-75% of Tech Prep participants went to two-year colleges, as compared with 18-58% of non-Tech Prep participants in the same consortia. Additionally, 5-53% of Tech Prep participants across consortia attended four-year colleges, compared to 17-55% of non-Tech Prep participants.

The authors of the NAVE assessment associated with Perkins III (Silverberg et al., 2004) noted that Tech Prep, as a separate title in the law, was designed to be "different from, and potentially better than, traditional vocational education" (p. 171). Yet they found few studies on outcomes for high school Tech Prep students, and those that existed showed no advantage in college attendance. Although Tech Prep had spurred some important efforts, the NAVE report concluded that its impact on postsecondary enrollment and completion was unknown.

Dual Credit

By dual credit, we refer both to concurrent enrollment, where students enroll and take classes in both high school and college simultaneously; and direct credit, where students receive high school and college credit for college-level courses taken while still a high school student (Andrews, 2004). Thirty-eight states have some policy regulating dual credit, and the remaining states allow for local definition and administration (Mechur Karp, Bailey, Hughes, & Fermin, 2004). In the 2002-03 school year, fewer than 5% of all high school students took courses for college credit within dual credit programs; 77% of these students were doing so at two-year colleges (Kleiner & Lewis, 2005).

High schools and colleges have collaborated to provide dual credit opportunities for several reasons. Dual credit demystifies the college experience for students, and it can shorten the time needed to finish a college degree, thereby encouraging persistence and completion. Dual credit can also be used for enrichment or credit retrieval purposes. Given the budgetary problems of many school districts, dual credit allows high school students access to a variety of courses that are unavailable to them in high school. Finally, colleges see dual credit as a recruitment tool.

Outcome studies are rare but dual credit initiatives show promise (Welsh, Brake, & Choi, 2005; Bailey & Mechur Karp, 2003). States report on student participation, academic performance, and the fiscal implications of dual credit, but as with many of the CTE efforts reviewed above, dual credit research is not as widespread as dual credit practice. Furthermore, many studies that do exist do not control for student characteristics in their outcomes (Bailey & Mechur Karp, 2003).

Students' High School Experience

The next section of the model depicts students' high school experience as a set of student behaviors and intentions: their attendance, their engagement in the classroom, their likelihood of dropping out, their progress toward graduation, their completion of high school, and their intentions after high school (see Figure 1, page 2). The literature reviewed below describes the relationship between these student behaviors and student outcomes.

Student Attendance

Before schools can improve academic achievement, they must ensure that students are attending. If students are absent too frequently or leave school prematurely, schools will not be able to help them master the skills necessary for work or further education. Poor student attendance has been described as one of the major problems that schools face (Orr, 1987), and several studies have been conducted to explore the causes of absenteeism and its effects on their performance at school—and beyond. It is clear that school attendance is related to positive student outcomes, and high absenteeism is related to negative behavior such as delinquency and gang membership (Aiken, Rush, & Wycoff, 1993; Towberman, 1994). As noted by Kaufman and Bradby (1992):

> School failure typically does not happen in a single day or year, but is a culmination of a gradual process of school disengagement over time. Poor attendance, cutting class, disruptive behaviors, and other actions are part of a cluster of student behaviors that indicate the student's disinterest in school. These behaviors are a part of the process that may eventually lead to poor achievement, early school withdrawal, or both. (p. 37)

There are a variety of explanations for and measures of absenteeism, but studies show that both student and school characteristics are associated with high rates of absenteeism. For example, Orr (1987) noted that African American and female students in a school's lower tracks (i.e., non-college bound tracks) are more likely to be absent than other students.

Less is known about the impact of CTE on absenteeism. Small-scale studies in Philadelphia show that students who participated in a school-to-work (STW) program had a better attendance rate than those who did not, while in Worcester, MA, the average number of days absent per student dropped from 4.49 to 1.77 for students engaged in STW activities (Dembicki, 1998). Another study linking STW initiatives with increased attendance indicated that "almost every study shows that students in School-To-Work have better attendance than comparable students. None indicate that they 'come to school less often'" (Hughes, Bailey, & Mechur, 2001).

Student Engagement in the Classroom

In addition to attending school, students must attend classes and be attentive in those classes. High rates of student attention and engagement have been found to be related to student achievement gains (Brophy & Good, 1986). Stallings (1980) and Brophy (1988) both noted that measures of student engagement need not approach 100% on-task use of classroom time. They found that an 80% or moderately higher engaged-time rate was consistently associated with higher achievement gains, while a rate lower than 80% was associated with lower mean achievement gains. Such research has been helpful in determining levels of student engagement in various school reform efforts (e.g., Castellano & Datnow, 2004).

Student Dropout

Dropping out of school is perhaps the strongest indicator of a lack of student engagement in school. Despite this, calculating dropout rates for individual schools and linking one set of curricular experiences to the likelihood of dropping out presents a number of methodological issues. First, who or what do we count? Many states and school districts calculate *event* dropout rates by counting the students who drop out in a given year. Another approach is to analyze *status* dropout rates, referring to those students aged 16-24 who were not in school and had not received their diploma or equivalent (Kaufman, Alt, & Chapman, 2004). Kaufman et al. suggest that status dropout rates are preferable for general questions of educational attainment.

Recent calculations using the Current Population Survey (CPS) place the national status dropout rate at 11% of the 16-24-year-old population in 2001 (Kaufman et al., 2004). These authors also provide state-by-state status dropout rates, but they are also based on the CPS. State data based on school reporting could produce different results because many states lack a way to track student progress. It is usually not known if students who move to another school are accounted for in the recipient school—a critical issue for computing dropouts. A status of "noncompleter" may or may not indicate a dropout. For example, a completion rate of 77% should not be assumed to indicate a dropout rate of 23%, although it is suspected that in most cases, that might be a good estimate. As many studies indicate, some students who drop out may return later in order to graduate.

Linking specific curricular activities to dropout prevention presents another layer of complication. CTE has long been thought to play a role in reducing dropout rates among high school students. Until recently, however, data supporting this contention have been relatively sparse.

If CTE does help reduce dropout rates, what is it about CTE that is associated with this outcome? For the purpose of this discussion, CTE and CTE-related activities include enrollment in a CTE "major" or concentration, in a career pathway or career academy, in Tech Prep, and/or in any of the various work-based learning activities described above. We do this because the alternative—simply identifying students as CTE concentrators by imposing a curricular template (e.g., three or more courses in a CTE sequence defines a concentrator)—suffers from two limitations. The first is temporal: Participation in CTE, especially CTE linked to the labor market, occurs during the junior and senior year, after many of those inclined to drop out have already done so. A second limitation is the wide disparity between what students say they are doing in high school and what a researcher-imposed course template assumes they did in high school (Stone & Aliaga, 2003).

Recent research on the relationship between participation in CTE and dropping out of high school has yielded mixed results. Two different analyses of the *National Education Longitudinal Study of 1988* (NELS:88) (U.S. Department of Education, 2005b) came to two different conclusions. The 2002 NAVE (Silverberg, Warner, Goodwin, & Fong, 2002) found no relationship between students classified as CTE concentrators (those who took three or more labor market preparation courses in a sequence) and a reduced probability of dropping out of high school.

Plank (2002) used the same longitudinal dataset (NELS:88), but in order to more fully describe the respective roles of CTE and academic coursework in dropping out, he elected to include dropouts in his analysis. Precisely because these students had dropped out, Plank reasoned, their transcripts would be incomplete and could not be categorized as CTE or any other concentration. Instead, Plank examined CTE as a proportion or ratio of the high school experience. He found that up to a certain point (about three Carnegie units of CTE to every four academic units), increasing the ratio of CTE coursework in a youth's high school experience lowered the probability of that youth dropping out of high school. This was especially true for lower-achieving youth. He concluded that a balanced combination of CTE and academic courses may reduce the probability of dropping out. Much like Plank's suggestion of combining CTE with solid academics, Brown (1998) also proposed combining CTE with other programs to address the special conditions that place individuals at risk of dropping out of high school.

More recent data are available through a new dataset (the *National Longitudinal Survey of Youth 1997,* or NLSY97) sponsored by the Bureau of Labor Statistics (U.S. Department of Labor, 2005a). This survey included youth who were 12-16 years old in 1997, or who would graduate in 1999 and beyond. Analyses of interview data from these youth are similar to the findings of the 2002 NAVE (Silverberg et al., 2002); that is, there does not seem to be a CTE effect on dropout rates when youth are categorized into curriculum concentrations (CTE, academic, general, or dual). This may be construed as either good news—i.e., CTE does not increase the likelihood of dropping out of school—or bad news—i.e., CTE does not reduce the likelihood of dropping out of school.

Student Progress Toward Graduation

Keeping youth in school, ensuring that they show up on a regular basis and pay attention in class so that they pass their classes and acquire the credits they need for graduation—these are the basic elements of high school success. Students need to accumulate sufficient credits in order to graduate on time. Depending on the state and school district, these totals vary, but the average is 26 Carnegie units (Levesque, 2003). Within these 26 credits, the number of required credits also varies but states have been increasing both the total required for graduation and the number of academic courses required as part of the total (Levesque, 2003).

More specifically, student progress toward graduation is especially dependent on credit accumulation in key academic subjects such as mathematics and science. Since 1978, there has been a 14% increase in the number of students taking Algebra (Campbell et al., 2000). Since 1986, there have been increases in the number of students taking all major science courses: General Science, Biology, Chemistry, and Physics (Campbell et al., 2000).

Studies have shown that taking more advanced math courses and more science courses are linked to higher achievement (Atanda, 1999; Gamoran, Porter, Smithson, & White, 1997; Madigan, 1997; McLure & McLure, 2000; Rock & Pollack, 1995; Smith, 1996). While this might seem obvious, the point that these scholars make is that this speaks to an opportunity to learn. Schools in areas with high concentrations of known risk factors (e.g., high urbanicity) tend to have more limited curricular opportunities (Lee, Burkham, Chow-Hoy, Smerdon, & Geverdt, 1998). Students in such schools may not have access to the high-level math or science courses necessary to meet federal, state, or local standards (Oakes, Muir, & Joseph, 2000). Large urban schools that serve high numbers of poor, minority, or immigrant students have not offered the same range of high-level mathematics or science courses, and in fact, have tended to offer more math courses below Algebra and more general science courses than schools serving more affluent, low-minority student populations (Lee et al., 1998; Lee, Smith, & Croninger, 1997; Oakes, Ormseth, Bell, & Camp, 1990).

With respect to the impact of CTE participation on academic course taking, results have been varied. Rasinski and Pedlow (1994) found no impact of CTE in gains in mathematics, science, or reading, although some moderate effects were found in sub-groups. In another study, Stone (2004) found that CTE students took more math and science courses and more demanding math and science courses, than students in the general track. Stone also found that participating in CTE was more advantageous than being a general concentrator in terms of the total number of math and science courses taken in high school. However, students in both concentrations lagged behind academic concentrators.

High School Completion

The most obvious signal of a successful high school experience is graduation, but just as with the dropout numbers, the question arises, whom to include? There are the high school "completers," e.g., those that "can be thought of as students who meet or exceed the coursework and performance standards for high school completion established by the state or other relevant authorities" (Young, 2003, p. 4). But *high school completer* is an umbrella term consisting of those "who were not still enrolled in high school" but "held high school credentials" (McMillen & Kaufman, 1997, p. 30). This definition covers two groups: (a) students who "attended high school, completed the required secondary school coursework, and graduated with a regular diploma;" and (b) those who had dropped out of school at some point, never returned, but used "the knowledge acquired while they were in school, perhaps in combination with skills and knowledge from their post-high school experiences or alternatively through special study programs, to take and pass a high school equivalency examination" (McMillen & Kaufman, 1997, p. 30).

Thus completers include both diploma recipients and other high school completers—students receiving a certificate of attendance or some other credential in lieu of a diploma. Some states do not issue this other high school completion type of certificate, but instead award a diploma to all completers regardless of what academic requirements the students have met (Young, 2003). The modified diplomas, such as Special Education Diplomas, are then counted in the graduation rates (National Governors Association, 2005). The question of whether graduates should include those with a GED arises. There is no consensus in the literature. Even within the National Center for Education Statistics, there are conflicting ways of treating students with a GED. McMillen and Kaufman (1997), for instance, indicated that those with a regular diploma are *graduates*, and those with a GED or those who returned to finish high school after dropping out are *completers*. Measuring the most obvious signal of a successful high school experience is not as simple as it first appears.

Studies have indicated a positive impact of CTE participation on high school completion. When compared to students in the general track, Stern and colleagues concluded that CTE students remained in school longer (Stern, Dayton, Il-Woo, Weisberg, & Evans, 1988), a finding supported by Batsche (1985). Hughes et al. (2001) indicated that students participating in school-to-work programs were "more likely than comparable students to complete the requirements and graduate on time" (p. 20). Using data from the NLSY97, Stone (2004) also found that CTE students had a greater chance of completing high school than those in the general track. However, Naylor (1987) voiced a caution that major concentration in a CTE program rather than casual participation is more helpful for student retention.

Post-High School Intentions

The final impact of the high school experience that we examined in this study involves how that experience shaped students' plans for after high school. Senior surveys are a common means of soliciting information about students' next steps after high school. Senior surveys are conducted by local school districts, state departments of education, and the federal government.

We hypothesized that students coming from schools that had adopted a type of career-based comprehensive school reform (i.e., some constellation of the components and practices described here) would be more likely to report having specific post-high school intentions than students coming from schools that had not explicitly adopted these components and practices.

Students' Post-High School Outcomes

High school outcomes were described above in the student behaviors section, since the behaviors we chose to research were those that led to the outcomes of interest. But beyond these high school outcomes, this model has been extended to include early community college outcomes as well (see Figure 1, page 2). Early postsecondary outcomes include the need for remedial education in college, enrolling in college, aligning the college major with the high school area of study, and progress during the first year of college.

We chose to limit the extension of our model to community and technical colleges for both practical and theoretical reasons. On the practical level, resource limitations prevented us from collecting data at the myriad colleges that students in the study could conceivably attend. On the conceptual level, we agreed that most community colleges offered students the postsecondary education they needed in order to enter the workforce or transfer to universities. The mission of community colleges is to provide local access to a high-quality combination of general education and the technical skills necessary to work in the increasingly information-based world economy. Indeed, studies have shown positive results on earnings from completing a community college occupational program (Grubb, 1995b, 1999; Sanchez & Laanan, 1998). Grubb (1995b) found that both certificates and associate's degrees increased the earnings of those who received them. He found that getting a job related to one's field of study had substantial benefits compared to getting another kind of job. A subsequent analysis using more recent data also supported these findings (Grubb, 1999).

CTE and Postsecondary Education

Until recently, students who majored or concentrated in CTE in high school were assumed to be bound for work immediately after high school. However, research shows that among students who go directly into the workforce after high school, more and more are also attending college. A recent study of high school CTE students in Washington State showed that only 9% of these CTE students worked without continuing their education during the first year after graduation (Washington State Workforce Training and Education Coordinating Board, 2003). In his study of career academies, Kemple (2001) found that students in a career academy spent an average of 3.2 months working in the 10 months following graduation, but these students also spent an average of 3.6 months both working and attending school. Findings for non-academy students were similar.

The Need for Remediation

Most postsecondary institutions, and nearly all community colleges, offer at least one remedial reading, writing, or mathematics course (Wirt et al., 2004). These courses are prerequisites for degree and certificate-granting programs; they rarely count toward attainment of such credentials. In 2000, 42% of the nation's entering freshman students at community colleges required at least one remedial course (Wirt et al., 2004). Shults (2000) found a similar percentage (36%), but this jumped to 95% at some inner-city colleges, where the quality of secondary education lags behind that of more affluent areas. Research has shown that freshman enrollment in remedial courses is higher in community colleges with high minority enrollments (Wirt et al., 1998). These high numbers are a cause for concern, especially because there is a great deal of anecdotal evidence to suggest that many of these students never enroll in a college-level course and drop out before their goals are ever within reach (Deil-Amen & Rosenbaum, 2002; Silverberg et al., 2004).

Enrolling in College

College enrollment rates among recent high school completers have been increasing since national data began being collected. In 1960, 45% of recent high school completers enrolled in college. By 1992, 62% were enrolling, and by 2004, that percentage had risen to 67% were (U.S. Department of Education, 2006, Table 181). NELS:88 data show that among CTE concentrators in the class of 1992, 60% enrolled in college about one year after high school graduation, with 75% doing so eight years after graduating from high school (Silverberg et al., 2004). These numbers are not terribly different, and thus suggest that a CTE concentration can prepare high school youth for postsecondary education.

Aligning High School and College Programs of Study

Studies have shown that the returns of community college certificate and degree programs are significant when participants get jobs in the fields in which they studied (Grubb, 1995b, 1999; Sanchez & Laanan, 1998). Graduates who get jobs in their field of study tend to have higher earnings than those who do not (Grubb, 1995b). For this reason, we considered students' high school course of study in a similar fashion, and examined the alignment of that course of study with students' community college major. We understand, of course, that high school experiences with a given course of study may also serve to let students know what fields they do *not* want to pursue. However, when high school students choose a program of study and continue in that program area in college, they have the advantage of having begun their knowledge base and experience earlier than others.

Progressing Through College

Although a majority of young people start college in the first year or two following high school, a relatively small minority of those students successfully complete college (Rosenbaum, 2001). Accumulating credits, earning a high GPA, and completing a degree in a timely manner are important outcomes in postsecondary education. Examining the NELS:88 data, 43% of students from the class of 1992 completed a degree within eight years of graduating (U.S. Department of Education, 2006, Table 306). According to these data, another 30% of students began college but did not complete a degree program. By comparison, Silverberg et al. (2004) reported that 53% of CTE concentrators who enrolled in postsecondary education completed a degree within eight years of graduating from high school. Table 1 compares the percentages of the different types of degrees earned by those students who enrolled in college through 2000.

Table 1
College degree completion and highest level of education completed through 2000, 1992 high school graduates

High School Graduates	*Completed Degree Within Eight Years*	*Certificate*	*Associate Degree*	*Bachelor's Degree*	*Graduate Degree*
1992 graduates	43%	18%	15%	59%	7%
CTE concentrators from 1992 graduates	53%	27%	27%	43%	4%

Sources: Silverberg et al., 2004; U.S. Department of Education, 2006, Table 306.

In other research on the postsecondary attainment of high school CTE students, a six-year longitudinal study of Maryland students (Griffith & Wade, 2002) found that CTE students in 1993 took about the same number of years to obtain a degree at four-year institutions as their non-CTE colleagues (4.47 and 4.48, respectively). Their first-year GPA was also similar (2.56 and 2.58, respectively). In terms of two-year colleges, similar percentages of CTE and non-CTE students earned two-year degrees (6% and 5%, respectively). However, Griffith and Wade found that CTE students had a higher first-year GPA among those enrolled in a two-year college (1.91), compared to non-CTE students (1.78).

MacAllum, Yoder, Kim, and Bozick (2002) reported on the Lansing Area Manufacturing Partnership (LAMP) school-to-work program's pooled graduates from the classes of 1999 and 2000. At 18 months after high school graduation, 46% of LAMP students were enrolled in two-year colleges and 33% were enrolled in four-year colleges. During that time period, only 20% of LAMP students were not enrolled in any college. The LAMP college students had average college GPAs slightly above 3.0 in the sixth month after graduation from high school and again at the 18th month. In both cases, the LAMP graduates' GPAs were statistically similar to the comparison group students' GPAs.

The Current Study

Researchers and practitioners looking for replicable models of successful high school organization need to consider the role of CTE in preparing our nation's youth for the society that they will inherit and the economy that they will direct. Such outcomes research can no longer end with high school graduation. The most important studies of student outcomes will continue to track student progress after high school, as they venture into community colleges, universities, and workplaces. The literature reviewed here provides valuable clues to productive new paths for research and practice, but this work also raises important questions. Especially in the context of at-risk communities, have comprehensive school reform models infused with the components and practices of CTE affected student outcomes? More specifically:

- What is the effect of career-based comprehensive school reform on student engagement in high school (attendance, dropout), compared to student engagement at schools without these reforms?
- What is the effect of career-based comprehensive school reform on student achievement in high school (progress to graduation, high school completion), compared to student achievement at schools without these reforms?
- What is the effect of career-based comprehensive school reform on student transition out of high school (post-high school intentions, Tech Prep and dual enrollment participation, need for remediation, enrolling in college, aligning high school and college programs of study, progressing through college), compared to student transition at schools without these reforms?

The study described in subsequent chapters of this report sought to answer these questions. We selected high schools that were implementing some set of career-based comprehensive school reforms to study. These schools attempted to fundamentally change teaching and learning, assessment practices, and other processes of schooling. We collected data on the high school outcomes (engagement, achievement) of selected cohorts, and in come cases, followed graduates of these schools as they transitioned into their local community colleges in order to continue tracking their outcomes. We selected comparison schools located in the same or similar neighborhoods as the study schools. These comparison schools were not involved in career-based comprehensive reform efforts.[2] While this comparison means that the effect of CTE components and practices in and of themselves cannot be completely separated from the effect of CSR, that was not our intention. To address the separate effect of CTE, we have included CTE coursework as an independent variable in most of the analyses.

2 Virtually all schools are perpetually involved in one or more change efforts (Lee & Smith, 2001). However, we sought comparison schools there were not involved in focused, career-based, comprehensive school reform efforts of the scope present at the study schools. The study schools and comparison schools are described in Chapter 2.

CHAPTER 2
METHOD

This five-year longitudinal, mixed-method study examined diverse processes and outcomes through a combination of qualitative and quantitative methods (Tashakkori & Teddlie, 1998, 2002). The longitudinal component of the study involved following the progress of three cohorts of students as they proceeded through ten schools at three longitudinal sites—three middle schools, three high schools, three community colleges, and one regional skills center—over a four-year period. The use of the 7th, 9th, and 11th grade cohorts allowed for examination of the effects of the individual schools on students' progress. In addition and independent of the school effect, we also inquired about a CTE effect on student achievement, engagement, and transition, given that CTE was a key element of both the study design and of the reform efforts at these schools.

The components and practices that make up the model presented in Chapter 1 became elements that we sought in choosing schools for the sample, so that we could test that model. Subsequently, during data collection, our task was to ensure that those same elements were part of students' experience. We used qualitative and quantitative methods to ascertain that students received the "input" that we had hypothesized would positively affect student outcomes. This chapter describes the sample selection, data collection, and data analysis methods.

School Sample

The three longitudinal sites in the sample were identified and selected through a multistage sampling process. In early 2000, the research team wrote to the 50 state directors of CTE, soliciting nominations of sites that were implementing career-based comprehensive school reforms and that: (a) served a majority of students from low-income and racial/ethnic minority backgrounds, (b) provided exemplary CTE with well-documented records of substantial improvements in student outcomes, and (c) collaborated across middle school, high school, and community college levels. In addition, the sites would have to be representative of a range of geographic locations, urbanicities, high school organizational structures, and reforms being implemented.

Contact was usually initiated at the high school of the feeder pattern. We inquired about the school's demographic characteristics, including student participation in the free and reduced-price lunch program as an index for socioeconomic status. We asked about the school reforms they were implementing and for details on the career-based aspects of the reforms. High schools that were members of Tech Prep consortia and had articulation agreements with their local community colleges were preferred. If the state department of education had school achievement information online (not many did in 2000), we examined recent test scores.

High schools that satisfied these criteria were asked about their middle schools and community colleges to ascertain whether the entire set of schools would be appropriate for and interested in participating in the study. Additionally, they were asked to nominate possible comparison high schools located near them that served similar students but were not involved in reform efforts of the type and scope described here as career-based comprehensive school reforms. We contacted all of these other schools, and if all of the criteria and interest were present, the research team scheduled an exploratory site visit to the study schools.

It soon became clear that the set of criteria we desired could not all be met by any one site. There were high schools engaged in innovative reform combinations, but they did not serve large at-risk student populations. High schools that served at-risk students tended not to have strong records of achievement. Many high schools that were nominated were members of the High Schools That Work reform network, but we could not choose more than one from that particular reform. Finally, there were some promising sites currently under study by others, or with unusual characteristics that made them difficult to replicate. For example, in one case, a district had disproportionately funded a high school to showcase high technology CTE programs.

We worked around all of these constraints to select the sites. Final site selection was based on the primary criterion for this study design: schools that served high percentages of at-risk students by implementing career-based comprehensive school reforms. We felt that because the high school dropout rate among poor and minority students had become so alarming (U.S. Department of Education, 2006), finding reform structures that appeared to be successful with those populations was the order of the day—even without the kind of hard evidence of student achievement that might be expected and available today. In 2000, states were not required to have educational accountability systems. Many states did, but in some cases these systems were in transition from a norm-referenced to a criterion-referenced system. This was occurring in two of our nominated states, leaving us (and them) without state-level achievement trend data.

While these schools may have lacked evidence of student improvement in the form of state test scores, other evidence usually existed, such as high numbers of students attending postsecondary education with strong SAT scores. None of the initially nominated sites implementing innovative career-based reforms with large populations of poor and minority students had the strong record of academic achievement originally envisioned in our search process. Ultimately, we decided that where a school that served poor and minority students had begun to turn itself around through high academic expectations and career themes with strong connections to postsecondary education and business, such a school was probably doing something too new to have been captured by state test scores, but over the course of the study, the outcomes would become known. If the exploratory visit showed a clearly committed staff and engaged students, those sites were considered. The final practical criteria were to select sites in which all of the schools had the technological capacity to provide longitudinal data and the willingness to participate in the study.

The high schools and their comparison schools eventually selected for inclusion in the sample represented four common organizational structures that offer CTE. Specifically, we included a comprehensive, Grade 9-12 high school, which is the most common high school structure in the country, at about 15,000 nationwide (Lynch, 2000). Like many comprehensive high schools, the one in this study collaborated with a regional skills center to provide focused, half-day CTE programs for its students. This skills center also agreed to participate in the study. Nationwide, there are approximately 1,100 regional skills centers (Lynch, 2000). We included a vocational high school, of which there are about 250 in the country (Lynch, 2000). Finally, this study included a high school divided into career academies, of which there are 2,500 nationwide (Kemple, 2004). Table 2 presents some of the characteristics of the study schools in tabular form for easy reference.

Table 2
Characteristics of study schools

	Study High Schools		
Variables	*Academy High School (AHS)*	*Pathways High School (PHS)*	*Vocational High School (VHS)*
High School Organizational Structure	Career academies	Comprehensive high school with regional skills center	Vocational technical high school
CTE-based Comprehensive School Reforms	Urban Learning Center	Career pathways	High Schools That Work
Comparison School (similar student characteristics, no reforms)	C-AHS, an adjacent high school	C-PHS, a comprehensive HS (with regional skills center) located several towns away	C-VHS, one of the district's college preparatory high schools
Urbanicity	Large city urban	Semi-agricultural	Small city urban
Geographic Diversity	Southwest U.S.	Northwest U.S.	Northeast U.S.

Below, we briefly describe the six high schools that participated as one of the three study schools or their respective comparison schools.

Study Sites

Academy High School[3] is located in a large urban center in the West. The city is a hub for trade with Pacific Rim countries. Despite the city's large manufacturing base, the service sector, retail trade, and government sectors are the leading employers in the county. This city's population continues to grow, fueled in large part by immigration from Asia and Latin America (see Table 3).

Pathways High School is located in an agricultural area in the Pacific Northwest, where the primary local crops are potatoes and wheat. Many local jobs involve production agriculture, food processing, and agribusiness. There are also some industrial and manufacturing firms that developed to support nearby federal facilities. Due to its location, the city is a transportation hub for the Pacific Northwest, with links to the world by air, rail, truck, and barge. Table 3 provides 2000 U.S. Census data on the city's population statistics by race and ethnicity.

Vocational High School is located in a small city in the Northeast with a history as a manufacturing center for textiles and metal. As with many industrial cities in the region, the 1980s

3 All school names are pseudonyms, and all sites have been disguised without altering the general characteristics of the schools or communities.

Table 3
Population statistics for the longitudinal sites

Demographics	*City served by Academy High School*	*City served by Pathways High School*	*City served by Vocational High School*
Total city population	> 2 million	25,000-50,000	150,000-200,000
% Latino	46	56	27
% African American	11	3	20
% Asian American	10	2	2
% Native American	< 1	1	< 1
% White	30	37	49
% Other/multiracial	3	4	< 1

Note. The percentages may add up to more than 100 due to rounding and/or because individuals self-identified as belonging to more than one group. All data are derived from the 2000 U.S. Census (U.S. Census Bureau, 2001).

brought recession and the offshore flight of industry and manufacturing to this city. Most jobs in the city are in the service sector, in wholesale and retail trade, and in government. Table 3 provides general population statistics by race and ethnicity for this city, based on the 2000 U.S. Census.

When we first encountered the three high schools that became our study high schools, each one was implementing elements of more than one reform. As such, each school was co-constructing (Datnow et al., 2002) CTE and comprehensive school reforms in ways that the school personnel believed best fit their missions and contexts. All of these reform designs were described more thoroughly in Chapter 1; the current discussion focuses on the school contexts.

Academy High School (AHS) was divided into three career academies. As an Urban Learning Center, AHS was co-located in a single facility with an elementary school and a middle school. The small number of high school students listed in Table 4 masks the fact that AHS was a K-12 school of almost 3,400 students. Only students from the Urban Learning Center middle school could apply to the high school, and they were selected using a lottery process. Many of the rest of these students attended the comparison high school, C-AHS. As a much larger high school in the same urban core neighborhood, C-AHS suffered from ills common to overcrowded urban high schools: gang activity, fights, low student engagement in school, and a high dropout rate. Both high schools were part of a large urban district with over 60 high schools. Selected students from both AHS and C-AHS participated in an academic enrichment program for neighborhood students sponsored by a nearby private college. Comparative descriptive data for AHS and C-AHS are shown in Table 4.[4]

Pathways High School (PHS) implemented career pathways across the curriculum. The middle school at this site collaborated with the community college on a federal GearUp grant to develop strategies and activities to help middle school students plan and prepare for postsecond-

4 All data presented are rounded approximations to further protect the anonymity of the sites.

Table 4
School sample: Descriptive data from study sites and comparison sites

Demographics	*Academy High School*[a]	*Control-A High School*	*Pathways High School*	*Control-P High School*	*Vocational High School*	*Control-V High School*
Total Number of Students	600-800	3500-4000	2000-2500	1200-1500	1200-1500	1200-1500
% Latino	71	79	54	68	53	42
% African American	28	20	4	< 1	28	37
% White	< 1	< 1	38	31	17	17
% All Others	1	< 1	4	< 1	2	3
% Free/Reduced Lunch	94	71	50	50	68	83
% Limited English Proficiency	27	37	10	24[b]	10	8
% Special Education	3	1	11	13[b]	35	18[c]

Note. Unless otherwise noted, all data are from the 1999-00 school year.
[a]Total number of AHS students reflects entire K-12 school. However, the demographics presented reflect only those of the high school.
[b]LEP and special education percentages for C-PHS were only available for the entire district in 1999-00.
[c]Special education percentage for C-VHS is from 2003-04, the earliest year for which data were available.

ary education. PHS students interested in specialized CTE instruction could attend a regional vocational skills center that served several small districts. The skills center also participated in this study—there, we focused exclusively on PHS students. PHS was the only high school in its small-town district, so we found another single-high school district in the same valley that served demographically similar students to serve as C-PHS, the comparison school. Fortuitously, C-PHS sent students to a regional skills center too, and we collected data on C-PHS students at this other skills center. Descriptive data on PHS and C-PHS appear in Table 4.

Vocational High School (VHS) was one of four high schools in this city with one district. Three of the high schools were college preparatory in nature, and VHS was the district's vocational technical high school. Middle school students in the district could choose from among these high schools. Over the years, VHS had gained a reputation among middle school counselors, parents, and students as the appropriate destination for the district's lower-achieving and special needs students. Despite its widely acknowledged status as the district dumping ground, VHS also attracted motivated students who were interested in the concentrated CTE programs offered there. Therefore there was usually a waiting list to attend VHS. C-VHS was chosen as the comparison school because, among the college preparatory high schools in the district, it served a population that was the least different from the population attending VHS.

In conclusion, while we chose these sites using the best knowledge available to us at the time, four years of time spent in the schools revealed information that was not possible to know at the outset. One limitation that resulted was the realization that implementation of HSTW at VHS was virtually non-existent. When the site was nominated to us by the state CTE director, during our site selection visit, and during the subsequent negotiations before its selection, VHS was held up as a HSTW site that was making great strides in student engagement and achievement. Since HSTW does not have clearly visible reform elements such as mandated curriculum or instructional procedures (Borman et al., 2003), there was no other way to ascertain the level of implementation beyond the commitment to reform that we heard from the state and local administrators we spoke with, and the HSTW teams that had been put in place and that we heard from during the preliminary visit. As the study progressed, it became clear that there was not a critical mass of teachers who had "bought in" to the reform. As a result, the reform effort failed and affected the study results, as will be detailed below.

Quantitative Analyses

Quantitative analyses examined the relationships between the types of reforms implemented at the sites and gains in academic achievement and rates of on-time graduation. We gathered yearly data on these measures over four years. We also examined the relationships between these reforms and postsecondary aspirations, acceptance to a postsecondary institution, student need for remediation in college, and postsecondary credits earned at the local community college after high school graduation. We gathered data on these measures during the last two years of the study.

Student Samples

We gathered data on three cohorts of students. The first cohort, which was in 7th grade in 2000-01, moved into high school by the end of the data collection period, 2003-04. The second cohort was in 9th grade as the study began, and most of these students graduated in the spring of 2004, at the end of the data collection period. Members of the third and oldest cohort were in 11th grade in 2000-01, and most graduated from high school in the spring of 2002. Some continued to postsecondary education in the form of their local community college, which also provided data for this study. We used data from the different cohorts to answer different questions in the study.

High School Engagement and Achievement

For our analyses of high school engagement and achievement, we used data from the 9th-grade cohort. This group provided our best data on the full four-year high school experience at these schools. Unlike at the other sites, at AHS we had a de facto random assignment design. AHS used a lottery system to select students from its middle school (AMS), allowing us to construct four comparison groups. In the analyses that follow, we report only on the best comparison with AHS, a group consisting of those students attending the comparison high school who had attended AMS and applied to attend AHS but were not accepted. We call this group C-AHS. The other comparison groups are defined and their outcomes presented in Appendix D.

The background characteristics of the 9th-grade cohorts from each school are presented in Appendix A. For each comparison, we compared these student background characteristics for any significant differences. In summary:

- There were more African American students, fewer Latino students, and fewer Limited English Proficient (LEP) students at AHS than at C-AHS.

- There were more LEP students, more students participating in the free/reduced-price lunch program, and more African American students at PHS than at C-PHS, although the number of African American students at either school was quite small.
- There were more male students, fewer African American students, more Latino students, fewer White students, more special education students, and more students in the free/reduced-price lunch program at VHS than at C-VHS.

Details are found in Appendix A.

Postsecondary Transition

For our analyses of postsecondary transitions, we used data from the 11th-grade cohort. As with the 9th-grade cohort, the lottery selection process at AHS provided an opportunity to create a de facto random assignment design for the 11th-grade cohort. Again, we report here only on the best comparison with AHS, which in this case consists of those students attending the comparison high school who had attended AMS. (For this grade cohort, AHS was unable to provide information on which students had applied to attend AHS but had not been admitted.) Again we call this group C-AHS. The other comparison groups for this cohort are defined and their outcomes presented in Appendix D.

Several subsamples of the 11th-grade cohort were needed to conduct the postsecondary transition analyses. This is because of the breadth of analyses we chose to conduct. For example, we conducted a senior survey, but not all of the cohort members at each school responded to the survey. We collected data on Tech Prep and dual credit participation, but again, the students who participated were not exactly the same as the composition of the 11th-grade cohort. Finally, we collected achievement data on the subset of the 11th-grade cohort who attended their local community college. Each of these analyses necessarily used slightly different samples. However, for readability, we have chosen to stay with the “base” names of our cohorts, that is, AHS, C-AHS, PHS, C-PHS, VHS, and C-VHS, even though they refer to slightly different groups of students in different analyses. Table 5 provides a glossary of these cohorts and the analyses in which they were used.

We compared the background characteristics of the 11th-grade cohorts from each school for any significant differences. In summary:

- At AHS, the 11th-grade cohort consisted of fewer males, fewer special education students, and fewer LEP students than at C-AHS.
- At PHS, the 11th-grade cohort consisted of more African American students, more White students, and fewer Latino students than at C-PHS.
- At VHS, the comparison for the 11th-grade cohort was the same as it was with the 9th-grade cohort: more male students, fewer African American students, more Latino students, more special education students, and more students participating in the free or reduced-price lunch program than at C-VHS.

Details are found in Appendix A.

Table 5
Glossary of student population described by school names, by analysis type

Type of Analysis	*Glossary of student population described by school names (AHS, PHS, VHS, and comparisons)*
All High School Outcomes (attendance, risk-hazard model predicting dropout, grade promotion, math/science/CTE credits, graduation)	Cohort of students in 9th grade in 2000-01
Senior Survey (including post-high school plan alignment with high school course of study)	Cohort of students in 11th grade in 2000-01 who responded to senior survey
Dual Credit and Tech Prep	Class of 2002
Alignment of high school course of study with community college major	Cohort of students in 11th grade in 2000-01 who responded to senior survey, graduated from high school in 2002, and attended local community college
Community College Outcomes (need for remediation, credits earned, cumulative GPA)	Cohort of students in 11th grade in 2000-01 who graduated from high school in 2002, and attended local community college

The post-high school intentions of the senior class of 2002, most of whom were in our 11th-grade cohort, were captured in a senior survey. Descriptive data on the senior survey respondents are presented in Appendix A. These results show that across all sites, the senior survey subsamples were not significantly different from their counterparts in the 11th-grade cohort.

The subsample used for the examination of credit-based transition from high school to college (dual credit, Tech Prep) was an exception to the use of the 11th-grade cohort as the basis for analysis. Student outcomes in credit-based transition programs were not part of the data collected by the districts in most of our sites in 2002. These data were collected separately, usually with the help of a high school contact. The data on Tech Prep participation by the Class of 2002 came from our schools' reports to their state on CTE program performance under the Perkins III legislation. The data on dual credit participation by the Class of 2002 were gathered with help from the district, high school, and community college administrators who were in charge of the programs. Therefore the sample used for these analyses consists of the Class of 2002, which approximated but did not equal the 11th-grade cohort. For instance, the Class of 2002 could include students who arrived to the high school after we "captured" the cohorts in 2000-01.

Data on postsecondary education outcomes were provided for those members of the 11th-grade cohort who attended their local community college. At the AHS and VHS sites, both study and comparison school students attended the same community college (ACC and VCC, respectively). At the PHS site, the comparison school students could attend one of two community colleges, both of which provided data for this study (called PCC and CCC).

Again we tested the sample of students from the study schools and their comparisons who attended their local community colleges, to determine in each case if they were representative of their graduating class, or if they differed significantly from the graduates who did not attend that college. In these analyses, we found that both AHS and C-AHS graduates who attended ACC reflected their respective graduating classes demographically, and that they were not significantly different from their peers who did not attend ACC.

Similarly, we tested the sample of students from PHS and C-PHS who attended their local community colleges. We found no differences between the PHS graduates who attended PCC and the total graduating class. However, some differences were observed between PHS graduates who attended PCC and those who did not. PHS graduates who attended PCC were significantly less likely to have received LEP services or special education services in high school than students who did not attend PCC. Focusing on the PHS graduates alone, fully 39% of them attended PCC. PCC was the closest postsecondary option in this agricultural area, and was a popular choice among PHS students. It should be noted, though, that 28% of PHS graduates attending PCC were Latino, while 35% of 2002 PHS graduates were Latino. We found no significant differences at C-PHS.

Finally, we tested the sample of students from VHS and C-VHS. The only difference we found was that VHS graduates who attended VCC were significantly less likely to have received special education services in high school than VHS students who did not attend VCC. At C-VHS, we found no significant differences. Both VCC samples were predominantly female. All of these analyses of the community college attendees can be found in Appendix A.

In sum, the subsamples were not found to be so different from their counterparts in the 11th-grade cohort as to preclude their use in the relevant analyses. Readers may refer to Table 5 while reviewing the results to remind themselves of the exact composition of the sample.

Measures and Analyses

We used systems data (e.g., transcripts, attendance records) for some of the analyses. We used student survey data for others. Our analytic models used a common core of background characteristics to analyze the school or CTE effect on the outcomes of interest. Using school records, we included measures of:

- Gender (dummy coded with female as the omitted variable)
- Race/ethnicity (dummy coded with white as the omitted variable)
- Special education (dummy coded with non-special education as the omitted variable)
- Limited English Proficiency (dummy coded with non-LEP as the omitted variable)
- Poverty (school indicator for free/reduced-price lunch participation, dummy coded with non-participation as the omitted variable).
- 8th grade achievement (when available, state or standardized academic tests)

- School effects (dummy coded with the comparison school as the omitted variable)
- CTE effect (the amount of CTE coursework as a ratio of total credits earned)

Measuring High School Success and Postsecondary Transition

Our measures of high school success were rather straightforward and for the most part derived from high school and community college systems data. We sought to understand the school effect and, independent of school attended, the effect of taking CTE courses on our measures of student engagement, student achievement, and student transition to postsecondary. Other independent effects examined included student background characteristics, as listed above.

Student Engagement

Student engagement is defined in this study as attendance and (not) dropping out of high school. Attendance measures were drawn from systems records. Assessing dropout was somewhat problematic; its measure differed by site. Students who were not included in each subsequent year's data collection were considered "not in school." These were students for whom the district had no record of attendance that year. These students may have transferred to another district, participated in home schooling, or dropped out.

The school district to which AHS and C-AHS belonged did not have an official code for dropping out of high school. Here, we coded all students whose status was "unknown" as a dropout. The school districts to which PHS and VHS (and their comparisons) belonged did have codes identifying dropout, but also had an "unknown" code. For these two comparisons, we used the system code for dropout. Descriptive data on yearly student status at all three study high schools and their comparisons are provided in Appendix A.

To determine the CTE effect on dropping out, we used Plank's (2002) CTE/total course ratio approach as a predictor of dropping out of high school. As noted in Chapter 1, Plank examined CTE as a proportion of the high school experience or as a ratio, and he included dropouts in his analysis. We felt that this was a demonstrably more useful approach than defining CTE concentrators and using that as a predictor, since many students take various CTE courses without ever completing a sequence. In addition, students who drop out are censored from the sample. Both of these possibilities distort the influence of CTE courses on student dropout. We do not believe that this ratio is redundant with the main variable of interest, because students at the comparison schools had ample opportunities to take CTE courses. Recall that the study schools were selected based on their innovative career-based reforms, not on the number or concentration of CTE courses. In fact, in one case, comparison school students took more CTE courses than students at the study school (see results, Chapter 3).

The analysis of the CTE effect on dropout was done by estimating a competing-risk hazard model. In this context, the term "hazard" means the probability that a student either dropped out or persisted during a particular semester, given that the student had not dropped out or graduated before that semester. It is a "competing-risk" model because there were two possible outcomes—dropping out or persisting (where graduating was the final form of persisting)—rather than just one. In these analyses, we controlled for school attended.

Finally, to determine the contribution of the school or of CTE to credit acquisition, we used an ordinary least squares regression model. Below we describe how we determined what was and was not a CTE course.

Student Achievement

Student achievement is defined in this study as progress toward graduation and successfully completing high school on time. Progress toward graduation was measured by a count of credits earned, per student transcripts. We focused on mathematics, science, and CTE credits in these analyses.

Mathematics and science coursework were selected for analysis for several reasons. In terms of mathematics, participation and achievement are gateway indicators for positive post-high school outcomes such as postsecondary education attainment and labor market success (National Research Council, 1989; U.S. Department of Education, 1997). In addition, the mathematics course sequence in high school is usually well-defined, making cross-school comparison relatively straightforward. Participation and achievement in science are also gateway indicators of continued and future academic achievement. Finally, both math and science content are often embedded in CTE coursework, making student achievement in these academic subjects especially relevant.

We classified the level of math attained into two different categories: Algebra 1 or higher, and high-level math. The latter category was defined as anything higher than Algebra 2, including Trigonometry, Pre-Calculus, Algebra 3, Calculus, or Advanced Statistics. This allowed us to see how many students reached the Algebra 1 level, but also how many went on to the higher levels of math. This distinction would matter in a case where there might not be a significant difference in the Algebra 1 or higher credits earned, but there is a difference in high-level math credits earned. Such a situation would suggest that students from both schools were taking Algebra 1 at about the same rate, but that at one school, students took higher levels of math more often than at the other. The number of years a student was in school was controlled for using dummy variables so that withdrawal did not influence the number of credits earned.

English and social studies are also key academic subjects, and the importance of reading and writing skills for postsecondary ambitions and adult life and work is undeniable. We included a preliminary analysis of English course taking in a prior report (Castellano, Stone, Stringfield, Farley, & Wayman, 2004); however, we chose not to focus on English or social studies in this final report. We felt that achievement in these courses among our student samples could be confounded with learning English as a second language, given the large Limited English Proficient populations. We were not able to differentiate these effects in these subject areas given the time and resources available to us, and leave that important analysis for further research.

For CTE, we first assigned courses to the CTE categories provided by the Secondary School Taxonomy (SST) (U.S. Department of Education, 1999). According to the SST, there are three broad categories of vocational courses: General Labor Market Preparation (GLMP), Specific Labor Market Preparation (SLMP), and Family and Consumer Sciences (FCS). The vast majority of the CTE courses offered by our six high schools fell into the SLMP category, which includes several subcategories such as business, trades and industry, health, and technology. The CTE course variables included in our analyses were total CTE credits (determined by adding credits in GLMP, SLMP, and FCS). We did not include other academy courses at the career academy high school, such as Integrated English. After classifying the CTE courses, we decided to combine them back together, since the vast majority were SLMP courses. We saw no advantage to keeping them separate by SST category, and felt it would only have added further complexity to the presentation of results.

For graduation, we used systems designators that indicated the student had graduated. Graduation was coded as 1 = graduation, 0 = other condition (dropout, not graduated but still in school, other). Our analytic model here was the same as for the dropout analyses.

Student Transition to Postsecondary Education and Beyond

Our analyses of transition compared outcomes in terms of students' transition to the adult world, be that step further education or the workforce. The measures of this successful transition come from: (a) senior "next step" surveys, (b) high school records on credit-based transition programs such as Tech Prep and dual credit, and (c) achievement data collected at the local community colleges. Data on students who attended other colleges or who entered the workforce directly after high school were not collected as part of this study.

Surveys given to students in their senior year were the source for data regarding post-high school plans, and, for study school students, the alignment of these plans with their high school course of study. Appendix A reports the senior survey response rates at each school. Students from all high schools who seemed likely to graduate (i.e., it appeared as though they would earn enough credits by the end of the semester) were given a senior survey in May 2002. When the semester ended, we received a list indicating the final status for all students in the cohorts. Some of the students who took the survey graduated, others did not, still others transferred or their final status was unknown. The analytic sample consists of seniors who took a senior survey and either a) graduated or b) did not graduate. Thus the analytic sample eliminated those students who took a senior survey but then transferred or ended up with an unknown status.

Study school students were asked if their job or college studies would follow their high school course of study. By definition, the comparison schools did not offer any career-based courses of study like the study schools did, so this alignment question was not asked of those students. It is important to note that the fact that this question is not relevant at the comparison schools helps describe the "treatment" we mean by career-based comprehensive school reform: rigorous academics being consciously integrated into a career-related group of courses. While students at the comparison schools could be in a CTE sequence of courses, there was no attempt to integrate CTE into the academic mission there.

Data on Tech Prep and dual credit participation were reported by high school and community college staff. Finally, measures of community college success relied on college transcript data. These measures included: remediation courses, number of credits earned, and college grade point average (GPA). Analyses of the need for remediation employed a logistic regression model (1 = at least one remediation course; 0 = none), since the outcome variables were dichotomous. In these analyses, we used the same set of background characteristics described above. In predicting college credits earned and GPA, we used an ordinary least squares regression model.

Our ability to examine post-high school outcomes was limited by our budget, and by the current ability to track individual students as they move from the secondary system to postsecondary education. We asked our K-12 district contacts to provide the community colleges with the student identification system we had developed in order to collect high school achievement data anonymously. In that way, college staff could match and provide postsecondary data on the students who had attended one of our high schools while preserving student anonymity. Although effective, the process was somewhat more laborious for the school personnel than anticipated, and data collection was delayed.

Qualitative Data Collection

To create case studies of the study high schools at the three longitudinal sites, the research team made annual site visits to each site over a four-year period, beginning with the 2000-01 school year and ending with the 2003-04 school year. As much as practical, we scheduled the site visits for the same time each year for each site. Each visit was designed to follow our three cohorts. Thus, the first two years included visits and data collection at the middle schools in order to follow the 7th grade cohort. The last two years included visits to the community colleges in order to collect data on the 11th grade cohort. All four years included time spent at the high schools. A team of four or five researchers spent approximately four days at each study site each year, visiting the various schools at each site.

Interviews

We conducted individual interviews and focus group interviews (Krueger, 1994) with stakeholders (teachers, students, and administrators) at all of the schools at each study site. In total, we conducted 296 interviews and interviewed 345 people. Appendix A presents a table of interviewees by stakeholder type.

We used semi-structured interview protocols that were updated for those stakeholders who were interviewed more than once. In the early interviews, we asked teachers and administrators to describe how the comprehensive reforms and the CTE reforms were introduced and implemented at the schools. In later interviews, we asked all stakeholders how the implementation of these reforms was changing the school, their work, and student achievement. When possible, the same questions were asked of each group of stakeholders for purposes of triangulation of data. In other instances, questions were posed to specific groups of stakeholders. Examples of each protocol may be found in Appendix A.

Classroom Observations

During the four years of site visits, the research team observed classes at the middle schools, the high schools, and the regional skills center. These classroom observations ranged from 50 minutes to 120 minutes, depending on the length of classes at that site. We employed a three-part observation protocol: a time interval sheet, a directed question form, and running notes. The entire protocol thus spanned the range from low-inference to ethnographic observations (cf. Castellano & Datnow, 2004; Datnow et al., 2003). The observation forms described here are further detailed and provided in Appendix A.

The first instrument, which we called the time interval sheet, was a modified version of the Classroom Observation Measure (COM), developed and validated at the University of Memphis (Ross, Smith, Lohr, & McNelis, 1994). This form required systematic, "snapshot" observations of the entire class every 6-14 minutes (depending on the length of the class), yielding low-inference data points on student attention and classroom orientation (i.e., teacher-led, project-based, etc.). The purpose of the time interval sheet was to reduce certain classroom events to variables that could then be compared across classes.

The second instrument, the directed question form, was used to gather rich descriptions of the classrooms we observed. This form required trained observer assessments of the presence or absence of various reform elements and classroom practices. The sources for the directed questions were primarily research on CTE classroom practices (reviewed in Castellano et al., 2003), and more general research on effective teaching and learning (Newmann & Wehlage, 1995; Tharp, 1997). Examples are provided in Appendix A.

The goal of the directed questions and the classroom observations in general was to describe the practices that were evident in the classroom when comprehensive school reform and CTE reform merge at the high school level. The unique aspect of the way that we utilized the time interval sheets and the directed questions was that we elicited trained researcher judgments on the presence and extent of *both* academic and CTE skills and activities *in both academic and CTE classes*. In other words, we used the same instruments for both types of classes, because we of course were after the extent of the integration that went on in the schools where these reforms had presumably been blended. For example, we asked team members to describe the writing that went on in CTE classes, as well as whether, say, math teachers talked to their students about how a particular mathematics concept could be applied to real-life contexts.

The third and final data collection device we used in the classroom observations was to take running notes of classroom activities, describing the actions of teachers and students. These running notes, taken in real time, were typed and submitted after each site visit.

The research team conducted a total of 185 classroom observations across all schools, for a total of 248 hours, approximately evenly divided into CTE and academic courses. Although we observed 185 classes, we do not have time interval sheets or directed question forms for all 185. Circumstances sometimes prevented us from completing one or more of the forms. We made every attempt to collect all of the classroom observation protocol instruments from research team members, but the percentage of both time interval sheets and directed question forms collected hovered around 50%. However, many of the classes for which we do not have these instruments were still entered into the database in other ways. For instance, we have running notes from many of the other classes, and for still others, we have descriptions of the classes in our after-school research team debriefs, which were taped and transcribed. So all was not lost from classes without observation protocol instruments. However, many of the same kinds of analyses could not be done on such class observations because they lacked the proper records. A quick tally revealed that of the 185 classes we observed, only 28, or 15%, were completely without any descriptive data at all.

Document Review

During the four years of data collection, we gathered many documents, such as school improvement plans, class syllabi and handouts, and district, state, and accreditation reports. These documents provided further information, and they were used to triangulate the quantitative and other qualitative data.

Limitations of Qualitative Data Collection

Each of the qualitative methods and research instruments selected for this study were modified for the specific research questions of this study. Despite this, we found limitations in the two major instruments we used, the directed question form and the time interval sheet. The directed question form was time-consuming to complete, and was designed to be completed after the observation itself. Given the scale of the study and the number of observations conducted by each research team member on each visit, it became difficult for some members to keep up. This helps explain the relatively low directed question form collection rate of 50%.

We also discovered a drawback to the time interval sheet once the study was underway. The section measuring student attention rates assumed that the observer could, at each one-minute observation point, glance around the classroom and determine the percentage of students who were on task. Such an assumption works in traditional classrooms, with student desks in rows or groups and the teacher in the front of the class. However, many of these classes were not organized traditionally, and therefore did not lend themselves to simple determination of student attention and engagement. For instance, in a welding class we observed, students moved between various stations in the large shop. Some were arc welding, others were bending or shearing metal, and still others were at the computer completing competency tests. In the one-minute observation, the researcher could not see all of the students in order to determine a student attention rate. Many of the classes that were most difficult to judge were CTE classes. However, when an English class went to the library and conducted research all period, the observation conditions were similar. In these cases, there was no way to be certain how many students were on task at any given time. In an unknown number of such cases, the time interval portion of the classroom observation protocol was abandoned. This also helps explain the low return rate of the forms, and quite possibly skewed the data collected from the time interval sheets toward a traditional classroom organization.

Finally, it must be noted that due to resource limitations, the study design did not include full case studies at the comparison high schools. That is, we did not conduct formal classroom observations or many interviews there. We visited each of the three comparison schools at least once during the study. We spoke with administrators, toured the campus, spoke with teachers and administrators, and in one instance, interviewed math and science teachers during those visits. Additionally, we were in yearly contact with each comparison school, because we collected data such as senior survey, Tech Prep participation, and dual credit enrollment from the schools, not the districts. Despite the lack of full case studies, we feel that the differences we found in student outcomes can be fairly confidently attributed to the school-level differences that we noted or that were evident (i.e., one school was vocational in mission while the comparison was college preparatory). Of course, further research on the conclusions drawn would be of great benefit to the field.

Qualitative Data Analyses

Although we discuss the qualitative analyses separately from the quantitative, the qualitative findings informed the quantitative outcomes. It is not enough to report student achievement without a sense of the context and practices that produced that achievement. All of the qualitative analyses described here rely upon the triangulation of data from multiple sources.

Interviews

All of the interviews were taped and transcribed verbatim. The transcripts were then classified by type (CTE teachers, district, students, etc.). Following the case study methods of Yin (1994) and the grounded theory approach of Strauss and Corbin (1990), the transcripts were coded and entered into a qualitative data analysis software package called HyperResearch© version 2.6. Coding involved reading the transcripts and marking the instances of concepts or topics of interest to the study. Such open or general coding identified concepts that were then developed through axial coding, which grouped the data into more specific and descriptive topical categories (e.g., uses of computer technology, the role of professional development). We also reduced the data in some codes to a series of matrices (e.g., creating tables of students' career plans) to aid in within- and cross-site analyses (Miles & Huberman, 1984).

All of the data in HyperResearch could be queried by code on demand. This occurred at every step of the writing process. For instance, when writing about the senior survey, we queried the data by codes such as "post-high school plans." This yielded a report rich with information from various stakeholders, including students themselves, about what students planned to do after high school. During this process, the team triangulated the emerging findings with as many data sources as possible.

Classroom Observations

Two of the three elements of the classroom observation protocol could be treated as the interviews were—namely, coded and entered into HyperResearch: the directed question form and the running notes. As with the interviews, these elements of the observation protocols were classified by type of class observed (CTE, non-CTE, middle school). When codes were queried, results therefore came from both interview and classroom observation data.

The third element of the classroom observation protocol, the time interval sheet, was analyzed using SPSS 13.0 to calculate means and frequencies and to perform chi-square tests. For instance, we tallied all the CTE and non-CTE classroom observation intervals at each site, and then analyzed whether CTE classes had significantly more or less teacher-led time, or a higher or lower level of student engagement than academic classes.

Using multiple sources of data allowed us to triangulate findings. For example, both the time interval sheet and the directed question form elicited data on effective instructional practices or specific reform elements, one in more detail than the other. This allowed for both a broad survey of data across many classrooms, and an in-depth picture of individual classes. The interviews with the teachers who taught the classes, with the students who took the classes, and with administrators were a further means of ascertaining the presence and characteristics of the reform efforts and their effects at each school.

Validity and Reliability

The qualitative data were collected in order to determine that students did indeed receive the "input" of components and practices related to a career-based high school reform structure that would influence student experience and, consequently, student outcomes (see Figure 1, page 2). We paid great attention to the quality of the qualitative research design. We addressed several issues of validity and reliability. Members of the research team were familiar with the literature that comprised the basis for the classroom observation instruments and with the tenets of qualitative research.

Construct validity was addressed by using multiple sources of data to triangulate emerging findings. For example, we made multiple visits to each site. Each visit confirmed or refuted some aspect of our prior understanding of the site. We discussed these aspects during our taped after-school debriefs, and came to new understandings that were then tested the following day or the following visit. In addition, this study used multiple research modes. The interviews and multiple observation instruments were cross-checked. Rarely did we have only one data point on any aspect of this study. These qualitative data were also supplemented by the student achievement, senior survey, and community college data we collected (see quantitative methods above).

Finally, the site visit research team consisted of 14 people over the five years of data collection. It especially enhanced the validity of the conclusions we made to have different team members interview or observe a stakeholder who had previously participated. These multiple observers brought their own perspectives to bear on the interviews and observations, and all members added their viewpoints to our after-school debriefs. However, a core group of 6 individuals were involved in data collection and analysis throughout the study, ensuring continuity.

Other checks on the construct validity of the study included maintaining a chain of evidence (Yin, 1994), beginning with the procedures outlined here and leading to the evidence and results. This allows readers to clearly see the sources upon which our conclusions are based. We cite specific interviews, observations, and documents, all of which are available to readers upon request. Finally, we had stakeholders review drafts of relevant portions of the analyses to corroborate facts. These stakeholders may not have agreed with our interpretation or conclusions, but they did confirm the veracity of the facts.

We addressed issues pertaining to the reliability of the study by creating detailed data collection protocols, training all research team members on the protocol procedures, and developing a formal qualitative database that can theoretically be accessed and analyzed by others to yield the same results. In addition, we conducted several reliability checks of the classroom observation instruments and our own analytical procedures; these checks are detailed in Appendix A.

Mixed Methodology

Student achievement ultimately takes place in the classroom, so studying reform and its outcomes necessarily means conducting qualitative research. The qualitative portion of this study helped determine just what structural, programmatic, and organizational elements were found at the study schools. However, in and of themselves, qualitative results cannot predict student outcomes. But when those structural, programmatic, or organizational elements are placed into a model along with other variables, an idea can be tested. The presence of reform elements can be confirmed (as well as their absence at the comparison schools), measurements of the reform's impact can be taken, and student outcomes can reasonably attributed to the reform design and the larger school context.

Reporting the Results

In the reporting of the results that follows, we present each comparison separately. While that necessarily requires some repetition in presentation, we concluded that that was preferable to the myriad complications that would ensue if we tried to combine the results for three such different analytical pairs. It was never our intention to claim that the cases were similar beyond the selection criteria—that each study school had defined and developed their own career-based comprehensive reform, and that they each served a high number of poor or minority students.

CHAPTER 3
CAREER-BASED COMPREHENSIVE SCHOOL REFORM: STUDENT ENGAGEMENT, ACHIEVEMENT, AND TRANSITION

In this chapter, we compare the outcomes at the study and comparison schools in terms of student engagement, achievement, and transition. The engagement and achievement measures used the study's 9th-grade cohort, while the transition analyses used the 11th-grade cohort.

Fostering a Culture of Success at Academy High School

Academy High School (AHS) was implementing career-based comprehensive school reform through career academies and the Urban Learning Centers reform design. AHS students outperformed students at the comparison high school (C-AHS) on several key outcome measures.

Student Engagement: Going to School and Leaving School

School attendance is necessary for high school completion. We found that AHS students attended high school at a significantly higher rate than C-AHS students. As shown in Table 6, for students who were in the study for the entire four years, AHS students attended more often than C-AHS students. The exception was during the fourth (senior) year, when attendance rates were not significantly different. This may indicate that there is little difference in senior-year student attendance among those who persist through four years of high school.

Table 6
Mean attendance for AHS site 9th-grade cohort, by number of years students were in study

Years in Study	*School*	N *at Start*	N *Who Left*	*Mean Attendance 00-01*		*Mean Attendance 01-02*		*Mean Attendance 02-03*		*Mean Attendance 03-04*
Year 1	AHS	186	21	80.69						
	C-AHS	95	16	79.97						
Year 2	AHS	165	18	85.31		79.63				
	C-AHS	79	14	74.88	*	71.43				
Year 3	AHS	147	17	81.54		82.71		72.75		
	C-AHS	65	16	82.67		77.47	*	66.49		
Year 4	AHS	130	130	87.35		86.71		85.62		80.66
	C-AHS	49	49	82.89	*	80.28	*	80.90	*	80.52

*$p < .05$.

As a separate measure of student engagement, the model presented in Table 7 predicts the hazard or risk of dropping out, given certain student characteristics. The ratio of CTE courses taken to the total courses taken is strongly significant. This indicates that an increase in the ratio is associated with a meaningful decrease in the odds of dropping out, regardless of high school attended.

Table 7
Risk-hazard model with time-dependent covariate predicting unknown status, AHS site, 9th-grade cohort

	Cox & Snell $R^2 = .077$ Nagelkerke $R^2 = .216$			
Variable	*B*	*SE B*	*Hazard Ratio*	
Site (1 = Treatment)	0.19	0.40	1.21	
CTE Credit Ratio	-11.75	3.09	0.00	***
Male	0.23	0.34	1.26	
Latino	-0.07	0.46	0.93	
Special Education	-0.01	0.64	0.99	
Limited English Proficiency	-0.72	0.39	0.49	
Free/Reduced Lunch	0.04	0.47	1.04	
Eighth-Grade Math Achievement	-0.02	0.01	0.98	*
Missing Achievement Score	-0.78	0.80	0.46	
Years				
Years (1)	6.53	11.49	684.48	
Years (2)	7.54	11.49	1872.64	
Years (3)	8.29	11.49	3997.47	

Note. $N = 820$ and excludes transfers and ill/deceased students. District data did not include a dropout code, only students whose location is unknown. We have counted unknowns at this site as dropouts. All coefficients rounded to two digits.
*$p < .05$. ***$p < .001$.

Student Academic Achievement Outcomes

Significantly fewer AHS students were promoted to the next grade in Years 1 and 2 of the study than were C-AHS students. In Year 3, students were promoted from one grade to the next at similar rates at AHS and C-AHS (see Table 8).

Table 8
AHS site promotion status of students who remained in study by year staying in study, 9th-grade cohort

Year	*School*	N	*% in Next Grade*	
Year 1	AHS	156	73.9	
	C-AHS	79	100.0	*
Year 2	AHS	138	86.4	
	C-AHS	65	100.0	*
Year 3	AHS	121	93.8	
	C-AHS	49	100.0	

*$p < .05$.

Earning Math and Science Credits

AHS students earned significantly more math credits than C-AHS students, but about the same number of science credits (see Table 9). We sought to explain the number of credits earned as a function of school of attendance and the background characteristics listed in Chapter 2. Since most AHS and C-AHS students took Algebra in 8th grade (recall that C-AHS is the subsample from C-AHS who attended AMS and applied but were not accepted to AHS), we did not expect much difference in the number of students who earn credits in Algebra or higher, but the real measure of difference would be in predicting credits earned in high-level math, defined as anything higher than Algebra 2, including Trigonometry, Pre-Calculus, Algebra 3, Calculus, or Advanced Statistics.

Table 9
AHS site average mathematics and science credits, 9th-grade cohort

		Math Credits			*Science Credits*	
School	N	*Mean*	*SD*		*Mean*	*SD*
AHS	130	3.00	1.17		2.63	0.80
C-AHS	49	2.39	0.73	*	2.78	0.77

*$p < .05$.

We examined the effect of attending either school and of student background characteristics on earning credits in these academic subjects. Since the *B* coefficient is the unit of analysis (in this case, credits earned), Table 10 provides information on the difference in credits earned. We found that attending AHS increased the likelihood of earning credits in high-level math. AHS students were likely to earn 0.4 more high-level math credits than C-AHS students. Also, prior math achievement was a significant predictor of math credits earned. Regardless of high school attended, the higher a student's 8th grade math achievement score, the more likely they were to earn more math credits, in either the Algebra or higher category or in the high-level math category. However, since we are using the C-AHS sample that attended the same middle school as AHS students, all students presumably had the same opportunities in middle school, thus allowing us to comfortably conclude that the advantage that AHS students have is due to the high school experience at AHS. With respect to science, the model was not significant in predicting the credits earned by AHS and C-AHS students.

Career and Technical Education Achievement Outcomes

Earning CTE Credits

AHS students earned significantly more CTE credits during high school than C-AHS students (see Table 11). When we controlled for background characteristics, we found that AHS students were significantly more likely to earn more CTE credits—over ½ credit more of CTE—than their peers at C-AHS (see Table 12). It is tempting to think that this was due to the career

Table 10

Linear regression predicting mathematics and science credit attainment, AHS site, 9th-grade cohort

	Algebra 1 or Higher Credits				High-Level Math Credits				Science Credits			
	Adjusted R^2 = .590				Adjusted R^2 = .483				Adjusted R^2 = .588			
Variable	*B*	*SE B*	*ß*		*B*	*SE B*	*ß*		*B*	*SE B*	*ß*	
Site (1 = Treatment)	0.04	0.13	0.02		0.40	0.09	0.21	***	-0.03	0.11	-0.01	
Male	-0.18	0.11	-0.06		-0.09	0.08	-0.05		-0.24	0.09	-0.10	**
Latino	-0.08	0.17	-0.02		-0.15	0.12	-0.07		0.13	0.14	0.04	
Free/Reduced Lunch	-0.07	0.16	-0.02		-0.18	0.11	-0.07		0.03	0.13	0.01	
Special Education	-0.49	0.24	-0.09	*	-0.33	0.17	-0.09		-0.53	0.20	-0.12	**
Limited English Proficiency	-0.02	0.14	-0.01		0.18	0.10	0.10		-0.08	0.11	-0.04	
Eighth-Grade Math Achievement Score	0.02	0.00	0.30	***	0.02	0.00	0.47	***	0.00	0.00	0.04	
Missing Achievement Score	0.64	0.29	0.10	*	0.36	0.21	0.09		-0.05	0.24	-0.01	
Years (1)	-2.25	0.17	-0.54	***	-0.53	0.12	-0.20	***	-2.22	0.14	-0.66	***
Years (2)	-1.75	0.18	-0.40	***	-0.59	0.13	-0.21	***	-1.67	0.15	-0.46	***
Years (3)	-1.23	0.18	-0.28	***	-0.44	0.13	-0.16	**	-1.03	0.15	-0.29	***

Note. N = 1297. All coefficients rounded to two digits.
*$p < .05$. **$p < .01$. ***$p < .001$.

academy courses, but recall that career academies are not the same as CTE programs or course sequences, and that courses such as the integrated English and social studies classes in these academies were not counted as CTE courses.

Table 11

AHS site average CTE credits, 9th-grade cohort

		CTE Credits		
School	N	*Mean*	*SD*	
AHS	130	2.42	0.91	
C-AHS	49	1.61	1.00	*

*$p < .05$.

Student Graduation

Graduation data on the 9th-grade cohort at AHS and C-AHS were obtained from the district. Table 13 shows that there was no difference in the odds of graduating from AHS or C-AHS, holding background characteristics constant.

Table 12
Linear regression predicting CTE credit attainment, AHS site, 9th-grade cohort

	CTE Credits			
	Adjusted R^2 = .487			
Variable	*B*	*SE B*	*ß*	
Site (1 = Treatment)	0.57	0.13	0.23	***
Male	0.00	0.11	0.00	
Latino	-0.03	0.16	-0.01	
Free/Reduced Lunch	-0.04	0.15	-0.01	
Special Education	-0.17	0.23	-0.04	
Limited English Proficiency	0.13	0.13	0.05	
Eighth-Grade Math Achievement Score	0.00	0.00	0.09	
Missing Achievement Score	-0.33	0.28	-0.06	
Years (1)	-1.74	0.16	-0.49	***
Years (2)	-1.40	0.17	-0.37	***
Years (3)	-1.03	0.17	-0.28	***

Note. N = 280. All coefficients rounded to two digits.
***p < .001.

Table 13
Logistic regression predicting graduation, AHS site, 9th-grade cohort

	C-AHS			
	Cox & Snell R^2 = .138 *Nagelkerke R^2 = .204* N = *226*			
Variable	*B*	*SE B*	*ß*	
Site (1 = Treatment)	-0.23	0.39	0.80	
Male	-0.69	0.37	0.50	
Latino	0.03	0.51	1.03	
Free/Reduced Lunch	0.43	0.70	1.54	
Special Education	0.10	0.52	1.10	
Limited English Proficiency	0.76	0.42	2.14	
Eighth-Grade Math Achievement Score	0.04	0.01	1.04	***
Missing Achievement Score	0.55	0.86	1.73	

Note. All coefficients rounded to two digits.
***p < .001.

Student Transition from High School

Significantly more AHS students reported having a post-high school plan than did C-AHS students (see Table 14). AHS students were significantly more likely to report being accepted to college, and less likely to report planning to enter the military. Table 15 shows that AHS and C-AHS students did not differ in their expectations of full- or part-time employment following high school. Of those who reported acceptance into college, AHS students were significantly more likely to report plans for full-time college attendance than were C-AHS students. Finally, AHS students were significantly less likely to report acceptance into an "other" type of college then were C-AHS students.

Table 14
Senior survey results, AHS site, 11th-grade cohort, survey respondents: Overall findings

	AHS			*C-AHS*			
	Valid	*Responded "Yes"*		*Valid*	*Responded "Yes"*		
Post-High School Trajectory	N	N	%	N	N	%	
Total % with plans	90	83	92	55	40	73	**
Employment	86	22	26	51	19	37	
College acceptance	89	82	92	48	29	60	***
Military acceptance	72	0	0	52	3	6	*

Note. Due to missing data, percentages may not add up to 100. Significance levels are based on chi-square analyses comparing intervention and comparison schools. AHS students were more likely to have overall plans for after high school than C-AHS students, $x^2(1, 145) = 10.08$, $p = .001$. AHS students were more likely to be college bound than C-AHS students, $x^2(1, 137) = 20.40$, $p < .001$. AHS students were less likely to be accepted into the military than C-AHS students, $x^2(1, 124) = 4.26$, $p < .05$.
*$p < .05$. **$p < .01$. ***$p < .001$.

Table 15
Senior survey results, AHS site, 11th-grade cohort, survey respondents: An in-depth look

	AHS		*C-AHS*		
	Responded "Yes"		*Responded "Yes"*		
Post-High School Trajectory	N	%	N	%	
Employed full time	7	33	7	41	
Employed part time	14	67	10	59	
Attend college full time	78	96	24	83	*
Attend college part time	3	4	5	17	*
Attend four-year college	51	63	17	59	
Attend two-year college	30	37	10	35	
Attend "other type" college	0	0	2	7	*

Note. Due to missing data, percentages may not add up to 100. Significance levels are based on chi-square analyses comparing intervention and comparison schools. Of those who reported acceptance into college, there were significantly more students at AHS who reported full-time college attendance than at C-AHS, $x^2(1, 110) = 5.80$, $p < .05$. Of those who reported acceptance into college, there were significantly fewer students at AHS who attended an "Other" type college than at C-AHS, $x^2(1, 110) = 5.69$, $p < .05$.
*$p < .05$.

Post-High School Plans and Student Characteristics

We next explored the school effect and other independent effects on student post-high school plans. The odds that AHS students had made post-high school plans were almost five times greater than for C-AHS students (see Table 16).

Table 16

Summary table: Log odds ratio of post-high school planning and work expectations, AHS site, 11th-grade cohort, senior survey respondents

AHS compared to:	*Post-high school plan*	*Employment*	*Full-Time Employment*	*Military*
C-AHS	4.55	n/s	n/s	n/s

Note. Logit likelihood ratios displayed are significant at $p < .05$. Coefficient represents the likelihood a student reported postsecondary plan by site. All coefficients rounded to two digits. Full regression tables are found in Appendix B. n/s means coefficient was not significant.

There were no significant differences in post-high school plans to work or to join the military. Going to AHS had very positive educational effects, however. The odds that AHS students reported that they had been accepted to college were nine times greater than at C-AHS (see Table 17). Among those accepted to college, there were no significant differences between AHS and C-AHS students in plans to attend four-year or two-year colleges.

Table 17

Summary table: Log odds ratio of post-high school education plans, AHS site, 11th-grade cohort, senior survey respondents

AHS compared to:	*Accepted to College*	*Attend College Full Time*	*Attend Four-Year College*	*Attend Two-Year College*
C-AHS	9.01	n/s	n/s	n/s

Note. Logit likelihood ratios displayed are significant at $p < .05$. Coefficient represents the likelihood a student reported postsecondary plan by site. All coefficients rounded to two digits. Full regression tables are found in Appendix B. n/s means coefficient was not significant.

Alignment Between High School Course of Study and Post-High School Plans

We compared AHS students' high school course of study with the course of study stated in their post-high school plans. We understand, of course, that high school experiences with a given course of study may also serve to let students know what fields they do *not* want to pursue.

More than half of the AHS students reported that their post-high school plans would be aligned with their academy (60%, see Table 18). Further examination showed that 86% of AHS students who planned to work full time said that their full-time job would follow their academy. A very small percentage of students with part-time jobs said the same (7%). Among those attending college, 66% of those attending full-time said that their college major would follow their academy, compared to the 33% of students attending college part time. Over 60% of the students attending four-year and two-year colleges said they would continue with their high school course of study.

Table 18
Alignment of high school course of study with post-high school plans, AHS, 11th-grade cohort, senior survey respondents

	AHS	
	N	%
Listed high school academy	90	100
Academy aligned with post-high school plan	54	60
	Aligned with academy	
	N	%
Employed full time	6	86
Employed part time	1	7
Attend college full time	51	66
Attend college part time	1	33
Attend a four-year college	34	67
Attend a two-year college	18	62
Attend an "other type" college	0	0

Credit-Based Transition Opportunities

Students at AHS and C-AHS had many postsecondary options in their immediate neighborhood: community and technical colleges, a campus of the state college system, and many public and private four-year universities. But year after year, most students from AHS who attended a community college chose ACC,[5] which was located across town in a more affluent neighborhood. ACC had a reputation as a community college that transferred many students to the state university system, making it an economical place to explore college.

Tech Prep. AHS did not have Tech Prep articulation agreements with any area community colleges, and the Tech Prep agreements at C-AHS were nominal. When the career academies were being developed at AHS, administrators did not see them as vocational programs. The career academy model was chosen more for the small learning communities than for the specific career preparation. AHS received little to no Perkins money, and the developers and leaders of the school's career academy curricula did not consider incorporating Tech Prep articulation agreements.

At C-AHS, programs and opportunities such as Tech Prep were not fostered. C-AHS was a very large urban high school that dealt daily with crises typical of inner-city schools. The main goals at C-AHS were getting students to attend class, study, and avoid the pitfalls that commonly led adolescents to drop out in such a context (e.g., gangs, drugs). C-AHS did not appear to have the personnel, time, or resources needed to pursue articulation agreements and other such oppor-

5 Demographic information on the local community college may be found in Appendix C.

tunities, despite the fact that providing such opportunities might have helped the staff achieve its goals. This is not an unusual state of affairs in urban secondary schools.

Dual credit. In the state where AHS and C-AHS are located, dual credit legislation provided both secondary and postsecondary credit for students concurrently enrolled. Students were responsible for all costs associated with attending the postsecondary institution.

Our examination of the data showed that most AHS students who took dual credit courses took them at community colleges closer to AHS than ACC. Being a small high school, the physical and human resources were not available at AHS to teach a wide range of courses. All graduation requirements could be met, but if students wanted to take more than the required number of math or science courses, they were encouraged to do so at one of several nearby community colleges. Other students used the colleges as a way of improving a marginal grade from AHS. By re-taking the class in college, they both improved their high school grade and earned college credit. Students did indeed take advantage of such enrichment and credit recovery opportunities, as shown in Table 19. Twenty percent of the AHS class of 2002 earned dual credit. Only 9% of the graduating class earned dual credit and attended ACC. However, we could not determine whether those credits actually accrued at ACC. Comparable data for C-AHS students were not available from C-AHS or ACC.

Table 19
Participation of the class of 2002 in dual credit programs, AHS site

	AHS		*C-AHS*	
	N	*% of graduating class*	N	*% of graduating class*
Students who earned dual credit from any college while in high school and graduated from high school	20	20	N/A	--
Dual credits earned while in high school	260	--	N/A	--
Students who earned dual credit while in high school, graduated from high school, and then attended ACC	9	9	5	2
Dual credits earned while in high school and then accrued at ACC	N/A	--	N/A	--

Attending the Community College

Alignment with high school course of study. ACC offered certificate and degree programs in the three AHS career academy areas: health careers, business and finance, and computer technology. According to the data provided by ACC, 62% of AHS students declared majors that were aligned with their high school academy, fewer than one-quarter declared majors that were not aligned with their academy, and 15% were taking general education courses (see Table 20).

Table 20
Alignment of high school course of study with ACC major, AHS site, 11th-grade cohort, attended ACC, graduated from high school, and responded to senior survey

	AHS		
	Valid	*Responded "Yes"*	
Alignment of ACC Major with High School Academy:	N	N	%
ACC major and high school academy do not align	13	3	23
ACC major and high school academy do align	13	8	62
Taking general education or liberal arts	13	2	15
Undecided	13	0	0

Remediation. ACC supplied information on the need for remediation of students from AHS and C-AHS. These data did not distinguish between math and reading remediation. There were no significant differences between AHS and C-AHS students in the need for remedial coursework at ACC (see Table 21). Over 60% of students from each group required remedial coursework. The model for the logistic regression was not significant in predicting overall remediation, probably due to small sample sizes (see Table 22).

Table 21
Need for remediation, AHS site, 11th-grade cohort, attended ACC and graduated from high school

	AHS			*C-AHS*		
	Valid	*Responded "Yes"*		*Valid*	*Responded "Yes"*	
	N	N	%	N	N	%
Overall remediation	13	8	62	11	7	64

Table 22
Logistic regression predicting need for remediation, AHS site, 11th-grade cohort, attended ACC and graduated from high school

	AHS and C-AHS		
	Cox & Snell $R^2 = .310$ *Nagelkerke* $R^2 = .423$ N *for model = 24* *Test of model = 8.91*		
Variable	*B*	*SE B*	*Exp(B)*
Experiment	1.47	1.69	4.34
Latino	8.50	63.93	4888.47
Male	.64	1.03	1.90
Free/Reduced Lunch	-16.63	90.36	.00
Special Education	-9.57	99.64	.00
Limited English Proficiency	-.69	1.53	.50
CTE Credit Ratio	-40.53	29.32	.00
Constant	11.35	63.96	85013.25

Note. All coefficients rounded to two digits.

Credits earned. The mean number of credits earned was significantly higher for AHS graduates than for C-AHS graduates (see Table 23). The regression model failed to predict cumulative credits earned (see Table 24).

Table 23
Credits earned and cumulative GPA, AHS site, 11th-grade cohort, attended ACC and graduated from high school

Achievement	*AHS* N	*AHS* *Mean (SD)*	*C-AHS* N	*C-AHS* *Mean (SD)*	
Credits earned	13	24.31 (20.23)	11	11.00 (5.06)	*
Cumulative GPA	13	2.05 (1.10)	11	1.69 (0.81)	

*$p < .05$.

Table 24
Linear regression predicting credits earned, AHS site, 11th-grade cohort, attended ACC and graduated from high school

	AHS and C-AHS		
	Adjusted R^2 = 0.046 N *for model = 23*		
Variable	*B*	*SE B*	*ß*
Experiment	9.28	9.98	.29
Latino	-2.12	15.17	-.04
Male	10.60	7.26	.33
Free/Reduced Lunch	-13.16	15.69	-.23
Special Education	-11.82	17.55	-.15
Limited English Proficiency	13.35	10.92	.36
CTE Credit Ratio	193.50	179.57	.35
Constant	-3.20	20.92	

Note. All coefficients rounded to two digits.

Cumulative GPA. There was no significant difference in the mean cumulative GPA between AHS graduates and C-AHS graduates (see Table 23). The regression model failed to predict cumulative GPA (see Table 25). Lack of significance for these findings may be due in part to the small sample sizes for each group.

Table 25
Linear regression predicting cumulative GPA, AHS site, 11th-grade cohort, attended ACC and graduated from high school

	AHS and C-AHS		
	Adjusted R^2 = -0.149 N *for model = 23*		
Variable	*B*	*SE B*	*ß*
Experiment	-.48	.65	-.25
Latino	-.74	.99	-.21
Male	.23	.47	.12
Free/Reduced Lunch	.72	1.02	.21
Special Education	-.43	1.14	-.09
Limited English Proficiency	.33	.71	.15
CTE Credit Ratio	20.13	11.68	.62
Constant	.21	1.36	

Note. All coefficients rounded to two digits.
*$p < .05$.

Summary of Engagement, Achievement, and Transition at Academy High School

Measures of student engagement and achievement were either similar at both schools or higher at AHS than C-AHS. Aside from the common senior-year slippage in attendance (National Commission on the High School Senior Year, 2001), attendance at AHS was better than at C-AHS, and there was no difference between the schools in the likelihood of dropping out. Regardless of high school attended, taking a higher ratio of CTE classes to academic classes reduced the risk of dropping out.

In terms of achievement, AHS students earned more math credits than C-AHS students. There was no difference in the odds of a student from either school earning credits in Algebra or higher, but the odds of earning high-level math credits were greater at AHS. While this seems contradictory at first, it should be noted that all AHS students attended AMS, and the comparison group for AHS is comprised of those C-AHS students who attended AMS. Since most AMS students take Algebra in 8th grade, we would not expect a large difference in the number of students from either high school group who have taken Algebra. But the category "high-level math," defined as Algebra 2 or higher, is more likely to distinguish between the AHS and the C-AHS high school experience. We had hypothesized that AHS students would go farther in the math sequence, and this was indeed the case.

There was no difference in the number of science credits earned at the two schools, nor in the likelihood of a student from either school earning more science credits. AHS students earned more CTE credits than their counterparts at C-AHS. There was no difference in the likelihood of a student from either school graduating on time.

In terms of student transition, more AHS students had a post-high school plan than C-AHS students, and more AHS students reported being accepted to college. More AHS students participated in dual credit opportunities than did C-AHS students, possibly due to the lack of resources at AHS to teach the broad range of courses available at many comprehensive high schools like C-AHS. Another possible explanation is that AHS students were savvy enough to start earning college credits while in high school.

The analyses of community college data revealed that AHS graduates earned more credits than C-AHS graduates. There was no difference in the average cumulative GPA of the two groups. Most students needed some form of remediation, regardless of high school attended. As the following chapter shows, the explicit goal of AHS is to send its inner city students to four-year universities. Given this, it is possible that the stronger AHS students indeed attended such universities, and that the group that attended ACC showed fewer differences in community college achievement compared to C-AHS students. Chapter 4 will elaborate on the context at AHS and provide the basis for our conclusions about the results seen at AHS.

Convincing Students of the Value of Education for All Careers at Pathways High School

Pathways High School (PHS) was the only high school in this district and small city. Students from three middle schools attended PHS. After fulfilling course requirements in 9th grade and learning about career pathways in two-week units on each pathway, students chose a pathway for the remainder of their high school years. Students chose from the following pathways: Arts and Communication, Business and Marketing, Engineering and Manufacturing, Environmental and Agricultural Science, and Health and Human Services.

Student Engagement: Going to School and Leaving School

Table 26 shows that PHS and C-PHS attendance rates were mixed, but there were two large drops in attendance: for students who left PHS after two years, and for those who left PHS during the fourth year. C-PHS students averaged 14% higher attendance than PHS students in the fourth year. Following the percentages in a row from left to right over the four years, it is clear that the average attendance rate for students was substantially lower in their last year of attendance (whether they withdrew early from the school or completed) than in prior years. This is true for both schools.

The model presented in Table 27 predicts the hazard or risk of dropping out, given certain student characteristics. Applying this model to PHS and C-PHS reveals that the risk of dropping out was more than three times higher for a PHS student than for a C-PHS student. Note, however, that the R^2 of the model indicates a moderate to weak fit to the data and suggests that important factors in the timing and likelihood of dropping out are not captured in the data.

Table 26
Mean attendance for PHS site 9th-grade cohort, by number of years students were in study

Years in Study	*School*	N *at Start*	N *who Left*	*Mean Attendance 00-01*		*Mean Attendance 01-02*		*Mean Attendance 02-03*		*Mean Attendance 03-04*	
Year 1	PHS	528	134	79.66							
	C-PHS	368	53	77.11	*						
Year 2	PHS	394	95	84.84		68.37					
	C-PHS	315	19	87.65	*	85.24	*				
Year 3	PHS	299	52	93.74		78.57		70.87			
	C-PHS	296	25	83.19	*	90.84	*	73.78			
Year 4	PHS	247	247	95.09		91.19		89.19		71.58	
	C-PHS	271	271	92.76	*	94.33	*	84.74	*	85.24	*

*$p < .05$.

Table 27
Risk-hazard model with time-dependent covariate predicting dropout status, PHS site, 9th-grade cohort

	Cox & Snell R-Square = .080 Nagelkerke R-Square = .183			
Variable	*B*	*SE B*	*Hazard Ratio*	
Site (1 = Treatment)	1.19	0.19	3.29	***
CTE Credit Ratio	-1.65	0.70	0.19	*
Male	0.01	0.16	1.01	
Asian	-0.58	1.05	0.56	
African American	0.99	0.41	2.70	*
Latino	0.42	0.23	1.52	
Special Education	0.18	0.21	1.20	
Limited English Proficiency	0.44	0.18	1.55	*
Free/Reduced Lunch	0.10	0.21	1.10	
Years				
Years (1)	8.07	6.99	3186.52	
Years (2)	7.61	6.99	2018.77	
Years (3)	7.64	6.99	2089.35	

Note. All coefficients rounded to two digits. $N = 2431$ and excludes transfers and ill/deceased students.
*$p < .05$. ***$p < .001$.

This table also shows that, independent of the school effect, the CTE ratio is a negative contributor to dropping out: an increase in the ratio of CTE to academic courses taken leads to a decrease in the likelihood of dropping out, regardless of which high school a student attended. This suggests that taking more CTE while in high school can play a role in keeping students in school.

Student Academic Achievement Outcomes

Significantly fewer students from PHS were promoted to the next grade in Years 1 and 2 of the study than were C-PHS students. In Year 3, students were promoted from one grade to the next at similar rates at both PHS and C-PHS (see Table 28).

Table 28
PHS site promotion status of students who remained in study by year staying in study, 9th-grade cohort

Year	*School*	N	*% in Next Grade*	
Year 1	PHS	394	48.5	
	C-PHS	315	76.8	*
Year 2	PHS	299	51.2	
	C-PHS	296	66.6	*
Year 3	PHS	247	64.4	
	C-PHS	271	66.8	

*$p < .05$.

Earning Math and Science Credits

There were no significant differences between PHS students and C-PHS students in the average number of math credits earned by the end of four years of high school, but PHS students earned significantly fewer science credits than C-PHS students by the end of four years of high school (see Table 29).

Table 29
PHS site average mathematics and science credits, 9th-grade cohort

		Math Credits		*Science Credits*		
School	N	*Mean*	*SD*	*Mean*	*SD*	
PHS	247	2.67	0.99	2.00	0.73	
C-PHS	271	2.57	1.25	2.89	1.47	*

*$p < .05$.

We also examined the effect of attending either school on earning these credits. It is important to remember that we are considering how many credits a student earned, not how many courses were attempted. The strong adjusted R^2 in these models (cf. Table 30) indicate that our covariate choices explained a large part of the variance, making the model a good fit to the data. Unfortunately, a comparable 8th grade achievement test (which may have been a significant contributor to the model) was not available at the PHS site.

Table 30

Linear regression predicting mathematics and science credit attainment, PHS site, 9th-grade cohort

	Algebra 1 or Higher Credits				*High-Level Math Credits*				*Science Credits*			
	Adjusted R^2 = .46				*Adjusted R^2 = .063*				*Adjusted R^2 = .507*			
Variable	*B*	*SE B*	*ß*		*B*	*SE B*	*ß*		*B*	*SE B*	*ß*	
Site (1 = Treatment)	0.44	0.07	0.16	***	-0.06	0.03	-0.07		-0.68	0.07	-0.24	***
Male	-0.17	0.07	-0.07	**	-0.03	0.03	-0.03		-0.11	0.07	-0.04	
Asian	0.12	0.32	0.01		0.11	0.15	0.02		0.21	0.32	0.02	
African American	-0.26	0.22	-0.03		0.00	0.10	0.00		-0.28	0.22	-0.03	
Latino	-0.23	0.09	-0.08	**	-0.09	0.04	-0.08	*	-0.24	0.09	-0.08	**
Other												
Free/Reduced Lunch	-0.25	0.08	-0.09	**	-0.05	0.04	-0.05		-0.20	0.08	-0.07	*
Special Education	-1.05	0.10	-0.27	***	-0.12	0.05	-0.08	**	-0.75	0.10	-0.18	***
LEP	-0.18	0.08	-0.06	*	-0.05	0.04	-0.04		0.07	0.08	0.02	
Years (1)	-1.77	0.09	-0.54	***	-0.16	0.04	-0.14	***	-1.85	0.09	-0.54	***
Years (2)	-1.55	0.11	-0.39	***	-0.16	0.05	-0.11	***	-1.32	0.10	-0.32	***
Years (3)	-1.01	0.12	-0.21	***	-0.09	0.06	-0.05		-0.78	0.12	-0.16	***

Note. N = 896. All coefficients rounded to two digits.
LEP = Limited English Proficiency.
*p < .05. **p < .01. ***p < .001.

As shown in Table 30, PHS students earned nearly 1/2 credit more in Algebra or higher math classes. However, for the more restricted subset of high-level math, we found no difference in credits earned. We did find a significant difference in science course taking, with PHS students earning about 2/3 credit less.

Career and Technical Education Achievement Outcomes

Earning CTE Credits

Our analyses of total CTE credits earned by the 9th-grade cohort show that PHS students earned significantly fewer CTE credits by the end of four years in high school than C-PHS students (see Table 31). This was also true when we controlled for key student background characteristics (see Table 32). One possible explanation for this is that career pathways at PHS were expressed in student electives, which include other subjects (e.g., drama, journalism, art) as well as CTE. Therefore, career pathways at PHS were broader than just CTE.

Table 31

PHS site average CTE credits, 9th-grade cohort

School	N	*CTE Credits* *Mean*	*SD*	
PHS	247	2.82	2.11	
C-PHS	271	3.99	1.93	*

*$p < .05$.

Table 32

Linear regression predicting CTE credit attainment, PHS site, 9th-grade cohort

	CTE Credits			
	Adjusted R^2 = .397			
Variable	*B*	*SE B*	*ß*	
Site (1 = Treatment)	-1.15	0.13	-0.25	
Male	0.34	0.12	0.08	***
Asian	0.25	0.56	0.01	**
African American	-0.19	0.39	-0.01	
Latino	0.12	0.15	0.03	
Free/Reduced Lunch	-0.07	0.14	-0.02	
Special Education	-0.30	0.17	-0.05	
Limited English Proficiency	-0.29	0.15	-0.06	*
Years (1)	-2.42	0.15	-0.44	***
Years (2)	-2.29	0.19	-0.34	***
Years (3)	-1.34	0.22	-0.17	***

Note. N = 896. All coefficients rounded to two digits.

*$p < .05$. **$p < .01$. ***$p < .001$.

Student Graduation

Graduation data on the 9th-grade cohort at PHS and C-PHS were obtained from their respective districts. Here we were particularly interested in the school effect and the CTE course-taking effect on this important outcome.

As shown in Table 33, PHS students were significantly less likely to graduate than C-PHS students. Specifically, the odds of graduating were two-thirds lower for PHS students than for C-PHS students, controlling for other student background characteristics. The R^2 of the model indicate only a moderate to weak fit to the data, suggesting that there are several significant contributors to graduation that we were unable to capture in our data and our model.

Table 33

Logistic regression predicting graduation, PHS site, 9th-grade cohort

Variable	*B*	*SE B*	*Exp (B)*	
	Cox & Snell R^2 = .154			
	Nagelkerke R^2 = .207			
Site (1 = Treatment)	-1.11	0.17	0.33	***
Male	-0.25	0.16	0.78	
Asian	1.31	1.10	3.71	
African American	-1.45	0.60	0.24	*
Latino	-0.53	0.22	0.59	*
Special Education	-0.69	0.23	0.50	**
Limited English Proficiency	-0.48	0.20	0.62	*
Free/Reduced Lunch	-0.40	0.20	0.67	*

Note. N = 726 and excludes transfers and ill/deceased students. All coefficients rounded to two digits.
*$p < .05$. **$p < .01$. ***$p < .001$.

Student Transition from High School

Results from the senior survey suggest that PHS students were significantly more likely to report having a post-high school plan, and significantly more likely to report that that plan was to work, than students at C-PHS (see Table 34). At both schools, however, those who planned to work were fewer than half of the respondents. There was no significant difference in full-time employment expectations or full-time college plans between PHS and C-PHS students (see Table 35). However, among students who reported planning to attend college, PHS students were significantly more likely to report acceptance into a two-year college than were C-PHS students.

Table 34

Senior survey results, PHS site, 11th-grade cohort, survey respondents: Overall findings

	PHS			*C-PHS*			
	Valid	*Responded "Yes"*		*Valid*	*Responded "Yes"*		
Post-High School Trajectory	N	N	%	N	N	%	
Total % with plans	197	162	82	173	124	72	*
Employment	191	91	48	168	52	31	**
College	187	116	62	168	90	54	
Military	190	18	10	167	13	8	

Note. PHS students were significantly more likely to have employment than C-PHS students, $x^2(1, 359) = 10.39$, $p < .01$. PHS students were also more likely to report plans for after high school than C-PHS students, $x^2(1, 370) = 5.85$, $p < .05$.
*$p < .05$. **$p < .01$.

Table 35

Senior survey results, PHS site, 11th-grade cohort, survey respondents: An in-depth look

	PHS		*C-PHS*		
	Responded "Yes"		*Responded "Yes"*		
Post-High School Trajectory	N	%	N	%	
Employed full time	57	69	31	74	
Employed part time	26	31	11	26	
Attend college full time	103	90	80	92	
Attend college part time	11	10	7	8	
Attend four-year college	46	40	46	52	
Attend two-year college	65	57	36	40	*
Attend "other type" college	4	4	7	8	

Note. Due to missing data, percentages may not add up to 100. Significance levels are based on chi-square analyses comparing study and comparison schools. PHS students were significantly more likely to attend a two-year college than C-PHS students, x^2 (1, 204) = 5.19, $p < .05$.
*$p < .05$.

Post-High School Plans and Student Characteristics

We next explored the school effect and other independent effects on student post-high school plans. Going to PHS had a very positive effect for some post-high school trajectories, as shown in Tables 36 and 37 (complete regression tables are found in Appendix B). Students attending PHS were about twice as likely as those from C-PHS to report having some sort of post-high school plan. This finding supports the efficacy of exposure to careers and the insistence on post-high school plans through career pathways at PHS. PHS students were also more likely to report planning to work and planning to attend a two-year college than were their counterparts at C-PHS.

Table 36

Summary table: Log odds ratio of post-high school planning and work expectations, PHS site, 11th-grade cohort, senior survey respondents

PHS compared to:	*Post-high school plan*	*Employment*	*Full-Time Employment*	*Military*
C-PHS	1.85	1.82	n/s	n/s[a]

Note. Logit likelihood ratios displayed are significant at $p < .05$. Coefficient represents the likelihood a student reported postsecondary plan by site. All coefficients rounded to two digits. Full regression tables are found in Appendix B. n/s means coefficient was not significant.
[a]Significant positive effect for Latino ethnicity in this contrast.

Table 37

Summary table: Log odds ratio of post-high school education plans, PHS site, 11th-grade cohort, senior survey respondents

PHS compared to:	*Accepted to College*	*Attend College Full Time*	*Attend Four-Year College*	*Attend Two-Year College*
C-PHS	n/s[a]	n/s[b]	n/s[c]	2.03[d]

Note. Logit likelihood ratios displayed are significant at $p < .05$. Coefficient represents the likelihood a student reported postsecondary plan by site. All coefficients rounded to two digits. Full regression tables are found in Appendix B. n/s means coefficient was not significant.
[a]Significant negative effects for Latino ethnicity and being male in this contrast.
[b]Significant negative effects for special education status and CTE credit ratio in this contrast.
[c]Significant negative effect for CTE credit ratio in this contrast.
[d]Significant positive effect for CTE credit ratio in this contrast.

Latino ethnicity had a negative effect on college acceptance regardless of school attended. Latino students were only about half as likely to report college acceptance as White students. By contrast, Latino ethnicity positively predicted acceptance into the military. A negative effect was found for gender: males were only about 56% as likely as females to report college acceptance. The CTE credit ratio negatively predicted full-time college attendance and acceptance into a four-year college. The CTE credit ratio positively predicted acceptance into a two-year college. These findings are consistent with those of AHS, discussed above, and with the 2004 NAVE report (Silverberg et al., 2004).

Alignment Between High School Course of Study and Post-High School Plans

We examined the alignment of PHS students' high school course of study with their post-high school plans. While strong alignment is a positive outcome, weak alignment is not necessarily negative, if students used the pathways experience to "test and experiment with what they may or may not want to do," as one CTE teacher put it.

A little more than half of the PHS students reported overall alignment of their post-high school plan with their high school course of study (57%, see Table 38). Interestingly, a larger percentage of students who responded that they would attend a four-year college were aligning their plans with their pathway than students who planned to attend two-year colleges. We believe this reflects the fact that career pathways were not exclusively CTE programs. Many students were in communications, engineering, or other pathways associated with a baccalaureate degree.

Table 38

Alignment of post-high school plans with high school course of study, PHS site, 11th-grade cohort, senior survey respondents

	PHS	
	N	%
Listed high school pathway	191	96
Pathway aligned with post-high school plan	112	57
	Aligned with HS pathway	
	N	%
Employed full time	34	60
Employed part time	13	50
Attend college full time	69	70
Attend college part time	7	78
Attend a four year college	31	74
Attend a two year college	43	69
Attend an "other type" college	3	75

Credit-Based Transition Opportunities

The city where PHS is located was served by one community college, PCC, and a satellite campus of the state college system. Those PHS graduates who planned to attend a postsecondary institution had the option of either attending one of these institutions, which allowed them to stay home and save money on living expenses, or leaving the city to attend an institution elsewhere, with the added costs of housing. Graduates of C-PHS could attend their local community college, here called CCC, or they could attend PCC.

Tech Prep. Tech Prep is growing in this state. State policy describes a common Tech Prep structure, in which students earn high school credits for classes taught in a high school by high school teachers. The content of these classes is articulated with the content of college classes so as to provide students with seamless transitions to postsecondary occupational programs. In addition, however, this state's policy stipulates that if Tech Prep students achieve above a set proficiency level, they may also earn college credit, much like the more academically-based dual credit systems. Students pay a one-time fee, and a college transcript is immediately generated that records the college, not the high school, as the institution where the credits were earned. This transcript is then transferable. This direct transcripting in this state has been one of the factors in the increase in student participation in Tech Prep.

Data were collected on Tech Prep participation by the class of 2002 at PHS and C-PHS. Table 39 shows that students from the class of 2002 at PHS passed more Tech Prep courses and earned more Tech Prep credits during high school than class of 2002 C-PHS students. This suggests a potentially smoother transition to postsecondary education for PHS students. After high school, fewer than half of the PHS seniors who were listed as Tech Prep participants in high school paid the one-time fee, accrued the Tech Prep credits, and attended PCC. It is beyond the scope of this study to ascertain whether the non-PCC students accrued their Tech Prep credits at other institutions.

Table 39
Participation of the class of 2002 in Tech Prep, PHS site

	PHS		*C-PHS*	
Tech Prep Participation	N		N	
Tech Prep courses passed in high school	47		8	
Tech Prep credits earned in high school	237		55	
	N	*% of graduating class*	N	*% of graduating class*
Students listed as Tech Prep participants by their high school[a]	48	17	N/A	--
Students who earned Tech Prep credits in high school and then attended PCC or CCC	26	9	6	3

[a]Defined as being enrolled in a class that has an agreement with the college, so students could conceivably earn college credit.

Dual credit. Dual credit programs were a long-established practice in this state, having been funded by the legislature for many years. As such, dual credit record-keeping was better here than in the other two states. The state-sponsored program offered students reduced tuition and the opportunity to earn their associate's degree during the summer following their high school graduation by enrolling in college courses during their junior and senior years in high school (and the subsequent summer). The state department of education reported that after an initial growth trend, participation in dual credit leveled off to an average of about 10% of eligible juniors and seniors statewide (State Board for Higher Education, personal communication, November 6, 2003). In cities and areas with many community colleges, participation could be as high as 40% of eligible students, while other parts of the state show no participation at all.

Participation of PHS and C-PHS students from the class of 2002 in dual credit was close to the state average, as shown in Table 40, with 9% and 14% of eligible students participating, respectively. At each high school, most of the students who earned dual credit did attend one of the two local colleges, bringing a substantial number of credits with them.

Attending the Community College

Alignment with high school course of study. Among the PHS students who declared a college major, roughly equal numbers of students aligned that major with their high school course of study as did not align it (see Table 41).

Table 40
Participation of the class of 2002 in dual credit programs, PHS site

	PHS		*C-PHS*	
Dual Credit Participation	N	*% of graduating class*	N	*% of graduating class*
Students who earned dual credit from any college while in high school and graduated from high school	24	9	26	14
Dual credit courses taken at PCC or CCC while in high school	255	--	217	--
Dual credits earned while in high school	1024	--	N/A	--
Students who earned dual credit while in high school, graduated from high school, and then attended PCC or CCC	14	5	22	12
Dual credits earned while in high school and then accrued at PCC or CCC	637	--	989	--

Table 41
Alignment of high school course of study with PCC major, PHS, 11th-grade cohort, attended PCC, graduated from high school, and responded to senior survey

	PHS		
	Valid	*Responded "Yes"*	
Alignment of PCC Major with High School Pathway:	N	N	%
PCC major and high school pathway do not align	54	26	48
PCC major and high school pathway do align	54	23	43
Taking general education or liberal arts	54	0	0
Undecided	54	5	9

Remediation. PCC and CCC provided information on the need for remediation by PHS and C-PHS graduates. Significantly fewer PHS students needed to take remedial courses overall than C-PHS students (see Table 42). In all of the categories of remedial coursework provided by PCC and CCC—i.e., math, English, and reading—significantly fewer PHS students needed remediation than C-PHS students. Most students who needed remediation needed it in mathematics, regardless of high school attended.

Table 42

Need for remediation, PHS site, 11th-grade cohort, attended CC and graduated from high school

	PHS			*C-PHS*			
	Valid	*Responded "Yes"*		*Valid*	*Responded "Yes"*		
Remediation	N	N	%	N	N	%	
Overall remediation	107	70	65	41	35	85	*
Math remediation	107	60	56	41	33	81	**
English remediation	107	34	22	41	25	61	**
Reading remediation	107	7	7	41	16	39	***

Note. PHS students were more likely to need remediation than C-PHS students overall, $x^2(1, 148) = 5.72$, $p < .05$; in math, $x^2(1, 148) = 7.57$, $p < .01$; in English, $x^2(1, 148) = 10.54$, $p < .01$; and in reading, $x^2(1, 148) = 23.83$, $p < .001$.
*$p < .05$. **$p < .01$. ***$p < .001$.

Going to PHS was a significant negative predictor of the need for reading and English remediation. PHS graduates were 15% less likely to need reading remediation and 33% less likely to need English remediation than C-PHS graduates (see Table 43). Full regression tables may be found in Appendix B.

Table 43

Summary table: Log odds ratio of need for remediation, PHS site, 11th-grade cohort, attended CC and graduated from high school

PHS compared to:	*Overall Remediation*	*Math Remediation*	*Reading Remediation*	*English Remediation*
C-PHS	n/s	n/s	.15	.33[a]

Note. Logit likelihood ratios displayed are significant at $p < .05$. Coefficient represents the likelihood that a student needed remediation by site. Full regression tables are found in Appendix B. n/s means coefficient was not significant.
[a]Significant positive effect of Latino ethnicity in this contrast.

Latino status was a significant predictor of English remediation. Latino students were more than 3.5 times more likely to need to take a remedial English class, regardless of high school attended. These results may be explained by the high numbers of nonnative speakers in both communities. Although many Latino students were no longer classified as Limited English Proficient at the time of graduation, many had at one time been in such programs. It could be that these students were able to transition into English-only high school courses, but the requirements for college-level reading and English were beyond their current levels of language proficiency.

Credits earned and cumulative GPA. PHS students earned significantly more credits than C-PHS students during their first year at PCC, at no cost to GPA. There was no significant difference in the average cumulative GPA of either group (see Table 44). Neither the model for the linear regression predicting credits earned nor the regression for cumulative GPA yielded significant findings (see Tables 45 and 46).

Table 44

Credits earned and cumulative GPA, PHS site, 11th-grade cohort, attended CC and graduated from high school

	Summer 2002 through Spring 2003				
	PHS		*C-PHS*		
Achievement	N	*Mean (SD)*	N	*Mean (SD)*	
Credits earned	104	28.24 (14.34)	41	21.37 (15.63)	*
Cumulative GPA	107	2.47 (0.93)	37	2.82 (1.04)	

*$p < .05$.

Table 45

Linear regression predicting credits earned, PHS site, 11th-grade cohort, attended CC and graduated from high school

	PHS and C-PHS		
	Summer 2002 through Spring 2003		
	Adjusted R^2 = 0.016 N *for model = 144*		
Variable	*B*	*SE B*	*ß*
Experiment	5.19	3.11	.16
Male	2.29	2.65	.08
Asian	3.04	8.82	.03
African American	3.26	6.97	.04
Latino	-4.05	3.37	-.13
Other	9.18	17.09	.05
Free/Reduced Lunch	3.05	3.50	.09
Special Education	-12.81	8.20	-.16
Limited English Proficiency	-2.53	6.62	-.04
CTE Credit Ratio	5.00	16.99	.03
Constant	21.88	3.82***	

Note. All coefficients rounded to two digits.
LEP = Limited English Proficiency.
***$p < .001$.

Table 46
Linear regression predicting cumulative GPA, PHS site, 11th-grade cohort, attended CC and graduated from high school

	PHS and C-PHS		
	Summer 2002 through Spring 2003		
	Adjusted R^2 = -0.013 N *for model = 143*		
Variable	*B*	*SE B*	*ß*
Experiment	-.31	.21	-.14
Male	-.03	.18	-.02
Asian	.09	.58	.01
African American	.103	.46	.02
Latino	-.05	.23	-.02
Other	-.87	1.12	-.08
Free/Reduced Lunch	.24	.23	.11
Special Education	.24	.54	.05
Limited English Proficiency	.13	.44	.03
CTE Credit Ratio	-1.64	1.09	-.14
Constant	3.00	.26***	

Note. All coefficients rounded to two digits.
****p* < .001.

Summary of Engagement, Achievement, and Transition at Pathways High School

Student engagement and achievement were lower at PHS than at C-PHS. C-PHS students equaled or outperformed PHS students on every measure: PHS students had a higher risk of dropping out, they earned fewer science credits, and were found to be less likely to graduate on time. There were no significant differences between the groups in math credits earned and likelihood of earning CTE credits. The results at the PHS site ran counter to our expectations. Perhaps career pathways as this school operationalized them did not help students succeed academically or see the value of education for their future.

Despite disappointing high school outcomes, and in keeping with the very mixed nature of the study results, PHS graduates outperformed their C-PHS counterparts on many measures of student transition to postsecondary education and work. More students had a post-high school plan at PHS than at C-PHS, and equal numbers were accepted to four-year universities. More PHS students participated in Tech Prep. The results at PCC were positive: at the end of one year of college, PHS students had earned more credits than C-PHS students. The remediation results were particularly striking: for each subject, far fewer PHS than C-PHS students were required to take a remedial course. These postsecondary results do not align well with the secondary achievement results, which might have suggested that PHS students would not be prepared for college-level work. While fewer students may have graduated from PHS than C-PHS (see Table

33), those who did graduate and continued their education at PCC (fully 39% of the students in the 11th-grade cohort, see Appendix A) performed rather well in terms of placing into college-level courses and accumulating credits. Perhaps the seamless transition provided by Tech Prep and dual credit programs contributed to this outcome. Chapter 4 provides further explanatory context for some of these findings.

Working to Make the Grade at Vocational High School

Vocational High School (VHS) was the only vocational high school in its district of four high schools, including the comparison high school (C-VHS). Middle school students could choose from among these high schools. VHS, the only non-college preparatory high school, was usually students' first or second choice, due to the wide range of CTE programs offered there. In addition, this city was struggling with poor academic achievement systemwide, so a vocational high school was an attractive alternative for many students. Historically, VHS had required fewer academic credits to graduate than the other high schools. While this was no longer the case during the study period, VHS had gained a reputation in the city as the preferred destination for the district's lowest-achieving students. At the end of their exploratory freshman year at VHS, students chose from among 13 vocational "shops" for intensive study for the remainder of their high school years.

Student Engagement: Going to School and Leaving School

The average student attendance rate of the 9th-grade cohort was essentially the same for VHS and C-VHS, both with respect to students who left the school before Year 4, and students who were there the entire four years (see Table 47). Only two comparisons out of ten show a statistical difference in attendance rates, suggesting that student engagement, as measured by attendance, was equally distributed across both schools. That is, students at VHS were as likely to attend school as those at the more college preparatory C-VHS.

Table 47
Mean attendance for VHS site 9th-grade cohort, by number of years students were in study

Years in Study	*School*	N *at Start*	N *who Left*	*Mean Attendance 00-01*		*Mean Attendance 01-02*	*Mean Attendance 02-03*		*Mean Attendance 03-04*
Year 1	VHS	352	83	67.62					
	C-VHS	361	90	67.62					
Year 2	VHS	269	93	76.56		63.47			
	C-VHS	271	75	78.84		64.45			
Year 3	VHS	176	36	81.57		76.31	68.41		
	C-VHS	196	52	79.80		74.26	66.53		
Year 4	VHS	140	140	88.79		87.13	86.01		86.68
	C-VHS	144	144	90.53	*	88.90	89.27	**	88.65

*$p < .05$. **$p < .01$.

However, as can also be seen from Table 47, attendance was not high at either school. Binkley and Hooper (1989, cited in Kaufman & Bradby, 1992) found that the attendance rates of students at risk of dropping out averaged 80%, compared to an average of 92% for other students. Taking the average across all ten data points from each school separately yields a 78% attendance rate at VHS and a 79% attendance rate at C-VHS. The students who left school before Year 4 (a group that includes dropouts) averaged 72% at each school. The students who stayed in school all four years had attendance rate of 87% at VHS and 89% at C-VHS. Even the most successful groups of students at these two schools did not meet Binkley and Hooper's threshold for nondropouts.

As a separate measure of student engagement, the model presented in Table 48 predicts the hazard or risk of dropping out, given certain student characteristics. The model reveals that the odds of a VHS student dropping out are 55% greater than for a C-VHS student. However, independent of the school effect, the CTE ratio is significantly associated with a decreased risk of dropping out. A cautionary note is that the R^2 for the model is modest and indicates a weak fit to the data. Nonetheless, students at VHS had bleak prospects for completing high school successfully, although being enrolled in CTE ameliorated that effect to some extent.

Table 48

Risk-hazard model with time-dependent covariate predicting dropout status, VHS site, 9th-grade cohort

	Cox & Snell R^2 = .076 Nagelkerke R^2 = .136			
Variable	*B*	*SE B*	*Hazard Ratio*	
Site (1 = Treatment)	0.44	0.20	1.55	*
CTE Credit Ratio	-1.79	0.74	0.17	*
Male	0.15	0.15	1.16	
Asian	-0.27	0.82	0.76	
African American	-0.57	0.25	0.57	*
Latino	-0.01	0.23	0.99	
Special Education	0.30	0.17	1.35	
Limited English Proficiency	0.24	0.34	1.27	
Free/Reduced Lunch	-0.45	0.16	0.64	**
Eighth-Grade Math Achievement	0.00	0.00	1.00	
Missing Achievement Score	-0.42	0.54	0.65	
Years				***
Years (1)	7.09	5.82	1204.22	
Years (2)	7.90	5.82	2688.23	
Years (3)	7.34	5.82	1545.88	

Note. N = 2754 and excludes transfers and ill/deceased students. All coefficients rounded to two digits.
*$p < .05$. **$p < .01$. ***$p < .001$.

Student Academic Achievement Outcomes

Students were promoted from one grade to the next at similar rates at both VHS and C-VHS, but significantly more students from VHS were promoted from 10th to 11th grade than at C-VHS (see Table 49).

Table 49
VHS site promotion status of students who remained in study by year staying in study, 9th-grade cohort

Year	*School*	N	*% in Next Grade*	
Year 1	VHS	269	78.1	
	C-VHS	271	72.3	
Year 2	VHS	176	83.2	
	C-VHS	196	80.1	*
Year 3	VHS	140	95.0	
	C-VHS	144	90.3	

*$p < .05$.

Earning Math and Science Credits

We found no difference in math credits earned between VHS students and C-VHS students (see Table 50). VHS students earned significantly fewer science credits than C-VHS students by the end of four years of high school.

Table 50
VHS site average mathematics and science credits, 9th-grade cohort

		Math Credits		*Science Credits*		
School	N	*Mean*	*SD*	*Mean*	*SD*	
VHS	140	3.62	1.45	2.53	0.83	
C-VHS	144	3.38	1.25	3.15	1.12	*

*$p < .05$.

We also examined the effect of attending either school and of student background characteristics on earning math and science credits. A comparable 8th grade achievement test was available at this site, and missing data on this variable is addressed using a dummy variable indicating that a student was missing this information. Two of the models produced strong adjusted R^2, indicating a good fit to the data. When compared to C-VHS students and controlling for other possible sources of variance, VHS students earned significantly fewer science and high-level math credits. There was no significant difference in the Algebra or higher math credits earned, suggesting that VHS students were taking Algebra at about the same rate as C-VHS students, but C-VHS students continued taking higher levels of math more often than VHS students (see Table 51). This difference is not surprising; VHS has a vocational mission that requires earning CTE credits during the same school hours that C-VHS students are focusing more on college preparatory credits.

Table 51
Linear regression predicting mathematics and science credit attainment, VHS site, 9th-grade cohort

	Algebra 1 or Higher Credits				*High-Level Math Credits*				*Science Credits*			
	Adjusted R^2 = .645				*Adjusted R^2 = .168*				*Adjusted R^2 = .674*			
Variable	*B*	*SE B*	*ß*		*B*	*SE B*	*ß*		*B*	*SE B*	*ß*	
Site (1 = Treatment)	0.09	0.08	0.03		-0.14	0.03	-0.16	***	-0.28	0.06	-0.10	***
Male	-0.05	0.08	-0.01		0.02	0.03	0.02		-0.10	0.06	-0.04	
Asian	0.29	0.37	0.02		0.09	0.14	0.02		0.25	0.29	0.02	
African American	-0.13	0.12	-0.04		-0.13	0.05	-0.15	**	-0.17	0.10	-0.06	
Latino	-0.21	0.12	-0.06		-0.13	0.04	-0.16	**	-0.18	0.09	-0.06	
Free/Reduced Lunch	-0.13	0.08	-0.04	*	-0.05	0.03	-0.06		-0.22	0.06	-0.08	**
Special Education	-0.21	0.09	-0.06		-0.07	0.03	-0.07	*	-0.18	0.07	-0.06	**
Limited English Proficiency	0.25	0.20	0.03		0.02	0.07	0.01		0.00	0.16	0.00	
Eighth-Grade Math Achievement Score	0.00	0.00	0.09		0.00	0.00	0.20	*	0.00	0.00	0.05	
Missing Achievement Score	0.35	0.27	0.08		0.21	0.10	0.20	*	0.28	0.22	0.08	
Years (1)	-3.05	0.10	-0.78	***	-0.29	0.04	-0.31	***	-2.56	0.08	-0.79	***
Years (2)	-2.65	0.10	-0.67	***	-0.25	0.04	-0.26	***	-2.15	0.08	-0.66	***
Years (3)	-1.88	0.12	-0.37	***	-0.27	0.05	-0.22	***	-1.79	0.10	-0.42	***

Note. N = 713. All coefficients rounded to two digits.
*$p < .05$. **$p < .01$. ***$p < .001$.

Career and Technical Education Achievement Outcomes

Earning CTE Credits

VHS students earned significantly more CTE credits by the end of four years in high school than C-VHS students (see Table 52). This is not surprising given that VHS is the vocational high school in the district, and C-VHS is one of the college preparatory high schools. The regression analyses show similar results, with VHS students significantly more likely to earn more CTE credits than C-VHS students. In fact, VHS students earned approximately five more CTE credits on average (see Table 53).

Table 52
VHS site average CTE credits, 9th-grade cohort

		CTE Credits		
School	N	*Mean*	*SD*	
VHS	140	12.24	1.99	
C-VHS	144	2.90	1.75	*

*$p < .05$.

Table 53

Linear regression predicting CTE credit attainment, VHS site, 9th-grade cohort

	CTE Credits			
	Adjusted R^2 = .643			
Variable	*B*	*SE B*	*ß*	
Site (1 = Treatment)	5.09	0.23	0.53	***
Male	0.19	0.22	0.02	
Asian	0.05	1.06	0.00	
African American	0.16	0.36	0.02	
Latino	0.28	0.34	0.03	
Free/Reduced Lunch	0.17	0.23	0.02	
Special Education	-0.75	0.25	-0.07	**
Limited English Proficiency	0.16	0.57	0.01	
Eighth-Grade Math Achievement Score	0.00	0.00	-0.06	
Missing Achievement Score	-0.83	0.77	-0.07	
Years (1)	-6.67	0.29	-0.59	***
Years (2)	-6.08	0.28	-0.53	***
Years (3)	-3.92	0.35	-0.27	***

Note. All coefficients rounded to two digits.
**$p < .01$. ***$p < .001$.

Student Graduation

Graduation data on the 9th-grade cohort at VHS and C-VHS were obtained from the district. Table 54 shows the results of an analysis predicting the likelihood of graduation from these schools. According to the data, the odds of graduating were not significantly different between VHS and C-VHS. However, the R^2 of the model demonstrate a poor fit to the data, indicating that many predictors of graduation were not included in our model, either because these factors were not available in demographic or transcript records, or because they were unmeasurable (e.g., family influence).

While the odds that a VHS student would drop out were higher than those for a C-VHS student (cf. Table 48), the finding that the odds of graduating are the same is puzzling at first blush. However, there are several possible explanations. First, the systemwide graduation rate was low, thus the variance between schools would be small. Second, while our models are statistically significant, they explain only a very small percentage of the variance in dropout or graduation rates. There are a number of unmeasured variables that could not be included in the model.

Student Transition From High School

Results from the senior survey suggest that similar numbers of students from the two schools reported having post-high school plans. VHS students were significantly more likely to

Table 54
Logistic regression predicting graduation, VHS site, 9th-grade cohort

	Cox & Snell $R^2 = .042$ Nagelkerke $R^2 = .056$		
Variable	*B*	*SE B*	*Exp (B)*
Site (1 = Treatment)	-0.26	0.19	0.77
Male	-0.36	0.19	0.70
Asian	0.40	0.97	1.50
African American	0.35	0.30	1.42
Latino	-0.19	0.29	0.83
Special Education	-0.30	0.21	0.74
Limited English Proficiency	-0.20	0.45	0.82
Free/Reduced Lunch	0.32	0.20	1.38
Eighth-Grade Math Achievement Score	0.00	0.00	1.00
Missing Achievement Score	0.65	0.82	1.91

Note. $N = 958$ and excludes transfers and ill/deceased students. All coefficients rounded to two digits.

report planning to work after high school, and significantly less likely to report having been accepted to college than their C-VHS counterparts (see Table 55). These are reasonable outcomes in a comparison between a vocational high school and a college preparatory high school.

Table 55
Senior survey results, VHS site, 11th-grade cohort, survey respondents: Overall findings

	VHS			*C-VHS*			
	Valid	*Responded "Yes"*		*Valid*	*Responded "Yes"*		
Post-High School Trajectory	N	N	%	N	N	%	
Total % with plans	166	157	95	133	128	96	
Employment	163	109	67	121	51	42	***
College	155	61	39	127	91	72	***
Military	153	11	7	123	10	8	

Note. Due to missing data, percentages may not add up to 100. Significance levels are based on chi-square analyses comparing intervention and comparison schools. VHS students were significantly less likely to be college bound than C-VHS students, $x^2 (1, 282) = 29.31$, $p < .001$. VHS students were significantly more likely to be employed than C-VHS students, $x^2 (1, 284) = 17.26$, $p < .001$.
***$p < .001$.

Among the students who said they would be employed after high school, there were no significant differences in full-time versus part-time employment plans between VHS and C-VHS students (see Table 56). Of those students who reported college acceptance, VHS students were significantly more likely to report plans to attend college part time, and to attend a two-year college, while C-VHS students reported significantly more full-time and four-year college attendance plans.

Table 56

Senior survey results, VHS site, 11th-grade cohort, survey respondents: An in-depth look

	VHS		*C-VHS*		
	Responded "Yes"		*Responded "Yes"*		
Post-High School Trajectory	N	%	N	%	
Employed full time	30	28	18	39	
Employed part time	77	72	28	61	
Attend college full time	46	82	86	97	**
Attend college part time	10	18	3	3	**
Attend four-year college	8	14	52	57	***
Attend two-year college	50	85	39	43	***
Attend "other type" college	1	2	0	0	

Note. Due to missing data, percentages may not add up to 100. Significance levels are based on chi-square analyses comparing intervention and comparison schools. Of those who reported college acceptance, VHS students were significantly less likely to report full-time college attendance than C-VHS students, x^2 (1, 145) = 8.84, $p < .01$. A smaller percentage of VHS students reported having been accepted into a four-year college than C-VHS students, x^2 (1, 150) = 28.33, $p < .001$. Conversely, a larger percentage of VHS students reported acceptance into a two-year college than C-VHS students, x^2 (1, 150) = 26.03, $p < .001$.
**$p < .01$. ***$p < .001$.

Post-High School Plans and Student Characteristics

We next explored the school effect and other independent effects on student post-high school plans. Going to VHS had a very positive effect on the likelihood of reporting having a job after high school graduation, and attending a two-year college (see Tables 57 and 58). VHS students were about 3.5 times more likely than C-VHS students to report planning to work after high school, and 16 times more likely to report acceptance into a two-year college. Conversely, attending VHS had a slight negative effect for college acceptance and attending a four-year college: VHS students were about 12% less likely than C-VHS students to report college acceptance and 6% less likely to report acceptance into a four-year college.

Table 57

Summary table: Log odds ratio of post-high school planning and work expectations, VHS site, 11th-grade cohort, senior survey respondents

VHS compared to:	*Post-high school plan*	*Employment*	*Full-Time Employment*	*Military*
C-VHS	n/s[a]	3.48[ab]	n/s[c]	n/s[cd]

Note. Logit likelihood ratios displayed are significant at $p < .05$. Coefficient represents the likelihood a student reported postsecondary plans by site. All coefficients rounded to two digits. Full regression tables are found in Appendix B. n/s means coefficient was not significant.
[a]Significant negative effect for LEP status in this contrast.
[b]Significant negative effect for African American ethnicity.
[c]Significant positive effect for being male in this contrast.
[d]Significant negative effect for Latino ethnicity.

Table 58

Summary table: Log odds ratio of post-high school education plans, VHS site, 11th-grade cohort, senior survey respondents

VHS compared to:	*Accepted to College*	*Attend College Full Time*	*Attend Four-Year College*	*Attend Two-Year College*
C-VHS	.12[a]	n/s	.06[b]	16.29[ac]

Note. Logit likelihood ratios displayed are significant at $p < .05$. Coefficient represents the likelihood a student reported postsecondary plans by site. All coefficients rounded to two digits. Full regression tables are found in Appendix B. n/s means coefficient was not significant.
[a]Significant negative effect for being male in this contrast.
[b]Significant positive effect for being male and significant negative effect for special education status in this contrast.
[c]Significant positive effect for special education status in this contrast.

Among the significant predictors of the various post-high school options, African American ethnicity had a significant negative effect on employment: African American students were 40% less likely to report employment than non-African American students. Mixed results were found for the effects of gender: being male had a significant positive effect on reporting full-time employment, acceptance into the military, and acceptance at a four-year college. On the other hand, being male had a significant negative effect on overall college acceptance and on attending a two-year college. Finally, special education status significantly predicted the type of college a student planned to attend, regardless of the high school attended. Students who received special education services were less likely to attend a four-year college and more likely to attend a two-year college than non-special education students. These full regression tables may be found in Appendix B.

Alignment Between High School Course of Study and Post-High School Plans

We examined the alignment of VHS students' high school courses of study with their post-high school plans. Less than half of the VHS students reported that their post-high school plans would be aligned with their high school course of study (see Table 59). More students who planned to work full time after high school reported such alignment than students planning to work part time. More students who planned to attend a two-year college reported alignment than those who planned to attend a four-year college. Again, these were not surprising results for a high school that prepared students for rather specific jobs. However, in general, alignment was low.

Credit-Based Transition Opportunities

Students from VHS and C-VHS had postsecondary options available to them nearby, ranging from the community college, VCC[6], to several small public and private liberal arts colleges.

Tech Prep. In this state, local control of schools is strong, so each Tech Prep consortium has developed its own unique features. In the VCC consortium, course articulation was downplayed

6 Demographic information on the local community college may be found in Appendix C.

Table 59
Alignment of high school course of study with postsecondary plans, VHS, 11th-grade cohort, senior survey respondents

	VHS	
	N	%
Listed high school CTE program	166	100
CTE program aligned with post-high school plan	68	41
	Aligned with HS CTE program	
	N	%
Employed full time	19	63
Employed part time	27	35
Attend college full time	24	53
Attend college part time	5	56
Attend a four year college	2	25
Attend a two year college	27	56
Attend an "other type" college	1	100

because the college administration felt that course curricula were too easily outdated. Instead, the VCC consortium created a Tech Prep "pipeline" of high school students. VCC staff recruited students at the consortium high schools during students' sophomore year. Interested students were required to get parental permission to register and participate in a series of activities throughout their last three years of high school, leading to the decision to continue their education and career preparation at VCC. More detail on the context for credit-based transition will be described in Chapter 4.

Given the expectations placed on Tech Prep pipeline students and the poor attendance record of VHS students generally, it was unlikely that VHS Tech Prep participation would be substantial. And indeed, only 10 students from the VHS class of 2002 were listed as Tech Prep students, and none from the class of 2002 at C-VHS (see Table 60).

Table 60
Participation of the class of 2002 in Tech Prep, VHS site

	VHS		*C-VHS*	
Tech Prep Participation	N	*% of graduating class*	N	*% of graduating class*
Students listed as Tech Prep participants by their high school[a]	10	6	0	--
Students who earned Tech Prep credits in high school and then attended VCC	0	--	0	--

[a]Defined as students who signed up for specific Tech Prep activities while in high school.

Dual credit. Prior to this study, dual credit legislation existed in the state where VHS and

C-VHS were located. This legislation stated that qualified high school students could dually enroll in postsecondary institutions with tuition paid by the state. However, when the state began to face dire budgetary problems, funding disappeared and this law was repealed. High school students could continue to enroll in postsecondary institutions while they were still in high school, but they had to shoulder the costs themselves.

There were no dual credit participants in the class of 2002 at either VHS or C-VHS. This is not surprising given the level of poverty of the majority of families in this city. Without state support for dual credit, many students were unable to afford such an opportunity.

Attending the Community College

Alignment with high school course of study. The college majors of VHS students were compared to their high school CTE programs and alignment was noted. Half of the VHS respondents reported that their major was aligned with their high school CTE program (see Table 61). The rest were split among those who did not align their VCC major with their CTE program at VHS, and those who were taking general education courses.

Table 61
Alignment of high school course of study with VCC major, VHS site, 11th-grade cohort, attended VCC, graduated from high school, and responded to senior survey

	VHS		
	Valid	*Responded "Yes"*	
Alignment of VCC with High School CTE program:	N	N	%
VCC major and high school CTE program do not align	22	5	23
VCC major and high school CTE program do align	22	11	50
Taking general education or liberal arts	22	5	23
Not matriculated	22	1	5

Note: Total exceeds 100% due to rounding.

Remediation. Both VHS and C-VHS students had very high rates of remediation (98% for both schools, see Table 62). Of the three categories of remedial coursework provided by VCC (i.e., math, English, and reading), the largest percentage of students from both schools needed math remediation. The model for the logistic regression was not significant in predicting overall remediation (see Table 63). However, Latino ethnicity emerged as a positive predictor for English remediation: Latino students were over six times more likely to need English remediation than non-Latinos, regardless of high school attended. Full regression tables may be found in Appendix B.

Credits earned. There was no significant difference in the number of credits earned by VHS students and those earned by C-VHS students (see Table 64) two years after high school graduation. The model for the linear regression was not significant in predicting the number of credits earned at VCC (see Table 65).

Table 62

Need for remediation, VHS site, 11th-grade cohort, attended VCC and graduated from high school

	VHS			*C-VHS*		
	Valid	*Responded "Yes"*		*Valid*	*Responded "Yes"*	
Remediation	N	N	%	N	N	%
Overall remediation	40	39	98	42	41	98
Math remediation	40	38	95	41	40	98
English remediation	40	28	70	42	35	83
Reading remediation	40	22	55	42	26	62

Table 63

Summary table: Log odds ratio of need for remediation, VHS site, 11th-grade cohort, attended VCC and graduated from high school

VHS compared to:	*Overall Remediation*	*Math Remediation*	*Reading Remediation*	*English Remediation*
C-VHS	n/s	n/s	n/s	n/s[a]

Note. Logit likelihood ratios displayed are significant at $p < .05$. Coefficient represents the likelihood that a student needed remediation by site. All coefficients rounded to two digits. Full regression tables are found in Appendix B. n/s means coefficient was not significant.

[a]Significant positive effect of Latino ethnicity in this contrast.

Table 64

Credits earned and cumulative GPA, VHS site, 11th-grade cohort, attended VCC and graduated from high school

	Summer 2002 through Fall 2004				
	VHS		*C-VHS*		
Achievement	N	*Mean (SD)*	N	*Mean (SD)*	
Credits earned	34	21.62 (15.92)	43	23.00 (17.71)	
Cumulative GPA	34	2.23 (0.62)	43	2.55 (0.55)	*

$*p < .05$.

Cumulative GPA. The mean cumulative community college GPA of C-VHS students was significantly higher than that of VHS students (see Table 64). Special education status negatively predicted cumulative GPA: students who received special education services in high school were more likely to have lower cumulative GPAs at the community college (see Table 66).

Table 65

Linear regression predicting credits earned, VHS site, 11th-grade cohort, attended VCC and graduated from high school

	VHS and C-VHS		
	Summer 2002 through Fall 2004		
	Adjusted R^2 = -0.065 N *for model = 76*		
Variable	*B*	*SE B*	*ß*
Experiment	-.49	9.43	-.02
Male	-3.87	4.27	-.11
African American	7.12	6.62	.21
Latino	6.60	6.70	.19
Free/Reduced Lunch	.10	5.70	.00
Special Education	-2.15	6.77	-.04
Limited English Proficiency	-11.44	13.35	-.11
CTE Credit Ratio	-.70	43.98	-.00
Constant	18.49	9.85	

Note. All coefficients rounded to two digits.
**p* < .05. ***p* < .01. ****p* < .001.

Table 66

Linear regression predicting cumulative GPA, VHS site, 11th-grade cohort, attended VCC and graduated from high school

	VHS and C-VHS			
	Summer 2002 through Fall 2004			
	Adjusted R^2 = 0.055 N *for model = 76*			
Variable	*B*	*SE B*	*ß*	
Experiment	-.25	.32	-.20	
Male	-.08	.14	-.06	
African American	-.17	.22	-.14	
Latino	-.07	.22	-.06	
Free/Reduced Lunch	-.07	.19	-.04	
Special Education	-.52	.23	-.28	*
Limited English Proficiency	.09	.45	.02	
CTE Credit Ratio	-.30	1.47	-.05	
Constant	2.80	.33***		

Note. All coefficients rounded to two digits.
**p* < .05.

Summary of Engagement, Achievement, and Transition at Vocational High School

Student engagement and achievement were generally low at VHS. Of all the high school measures we examined, VHS outperformed its comparison school only in promotion rates from sophomore to junior year and in CTE credits earned. One reason for these outcomes, of course, is that C-VHS is a college preparatory high school. It would not be commonly expected for a vocational high school to outperform a college preparatory high school on academic measures. However, the interesting story at the VHS site is the number of measures for which there was no difference between the two schools. There were no significant differences in attendance for eight of the ten comparisons, no difference in two of three years of promotion progress, no difference in math credits earned, and no difference in the odds of graduating from either school. These results are a testament to the hard work of the VHS teachers and administrators, which will be examined in Chapter 4. We observed their commitment to helping their students achieve. Incoming students performed well below grade level and often arrived with behavioral and attitudinal problems. That the VHS staff could take such a group and have them match the college preparatory high school in promotion progress and math credits earned in Algebra or higher by the end of high school is a positive outcome.

Of course, not all the results were positive. The odds of dropping out were much higher for a VHS student than for a C-VHS student. As will be better shown in Chapter 4, VHS was a school that had weathered crises for years. It was the acknowledged dumping ground for low-performing students in the district. For years, each successive freshman class arrived further below grade level than the last, so all the hard work that VHS staff did with each incoming class had to be done even more intensively the following year. Given such a situation, the results presented here show that many students worked hard to achieve at grade level and graduate. But many students were also non-performers, and the school had become a refuge for them.

The analyses of two years of community college data did not reveal many significant differences between VHS graduates and C-VHS graduates. Almost all of them needed some form of remediation, usually in mathematics. C-VHS graduates earned higher cumulative GPAs. Given that VHS historically worked with a more underprepared student population than C-VHS, these results are not negative for VHS. Instead, they lend credence to the claim by many VHS teachers and administrators that they were able to take students who came to high school performing well below grade level and put them on par with the district's other high schools on some measures. As we saw, students at VHS were more likely to drop out. But if they persisted, they *could* graduate from high school and attend college, although they would probably have to take remedial courses. In the following chapter we describe the challenges that VHS faced in its attempts at reform and the way those challenges affected the study results.

Discussion

This study was designed to compare student outcomes in engagement and achievement in high school, and in transition from high school to postsecondary education. We gathered attendance and achievement data from the districts in order to measure engagement and achievement. We surveyed the graduating class of 2002 to discover their post-high school intentions. We gathered data on their participation in credit-based transition programs (Tech Prep and dual credit).

For those graduates of our study and comparison high schools who attended their local community colleges, we were able to collect first-year achievement data. All of these efforts were made in order to learn about the outcomes of students from high schools implementing career-based comprehensive school reforms. A summary of the results is presented in Table 67.

Despite the mixed results, one finding held true across all six high schools: the odds of dropping out declined as the proportion of the high school experience invested in CTE courses increased (see Tables 7, 27, and 48). Independent of the school effect, we examined a CTE coursework effect, and found this to be a significant negative predictor of dropout regardless of high school attended.

Although the specific reforms differed in many ways, all three of our study high schools—AHS, PHS, and VHS—shared certain tenets. All three schools emphasized that students should have a post-high school plan. At two of the three sites, the study schools had significantly more students with a post-high school plan than their respective comparison schools. In one case, AHS, more students had plans to attend college. As we have seen, AHS groomed students for that outcome. At PHS, more students had plans to work and attend a two-year college. These are satisfactory outcomes in a high school combating a high dropout rate with a reform that showed students why they needed to finish high school and continue their education, no matter what career they chose. Finally, the number of students with a post-high school plan was similar at both VHS and its college preparatory comparison school. Not surprisingly, more students at VHS planned to work and fewer planned to attend college than at C-VHS.

Another measure of student planfulness was the examination of alignment between high school course of study and (a) student plans for after high school, and (b) student majors declared at the community college. A low number of students choosing to stay in their high school course of study would not be necessarily negative, because that could indicate that students had had a chance to explore and eliminate a potential career direction. Nevertheless, in these six measures of alignment (three sites, two opportunities for alignment at each), the percentage of students who remained in their high school course of study ranged from 41% to 62%. These are quite respectable percentages of students who had the opportunity to explore a career while in high school and chose to remain in that field as they moved out of high school. Such an opportunity must be seen as having given these students an advantage.

At two of the three sites, Tech Prep provided real opportunities to further prepare students beyond what the high school alone could offer. Only AHS did not participate in a Tech Prep consortium. Earning direct college credit for Tech Prep at both PHS and C-PHS greatly increased the number of students participating, according to administrators. At the VHS site, having Tech Prep pipeline students take the VCC placement test was useful for getting students to understand the importance of taking their high school academic courses seriously. Unfortunately, students at VHS were often very far below grade level, making success at college-level academics seem impossible. In addition, their poor attendance and indifferent attitude toward “follow-through” (which we also encountered in our attempts to interview students) boded ill for their ability to

Table 67

Summary of results: Engagement, achievement, and transition

	Academy HS	*Pathways HS*	*Vocational HS*
	compared to its comparison school		
Engagement			
Attendance	↑	↔	↔
Risk of dropout	↔	↑	↑
CTE coursework associated with decreased risk of dropping out	√	√	√
Achievement			
Promotion progress (3 years)	↓ ↓ ↔ [a]	↓ ↓ ↔	↔ ↑ ↔
Math credits earned	↑	↔	↔
Odds of earning high math credits	↑	↔	↓
Science credits earned	↔	↓	↓
Odds of earning science credits	↔	↓	↓
CTE credits earned	↑	↓	↑
Odds of earning CTE credits	↑	↔	↑
Odds of graduating on time	↔	↓	↔
Transition			
Has a post-high school plan	↑	↑	↔
Post-high school plan alignment	60%[b]	57%	41%
Accepted to college	↑	↔	↓
Plans to attend 4-year college	↔	↔	↓
Plans to attend 2-year college	↔	↑	↑
Plans to work full time	↔	↔	↔
Participated in Tech Prep	↔	↑	↔
Participated in dual credit	↑	↓	↔
Community college			
CC alignment with HS plan	62%	43%	50%
Need for remediation	↔	↓	↔
Credits earned	↑	↑	↔
Cumulative GPA	↔	↔	↓

Note. All differences noted are significant.
↑ = the study HS had a better outcome than its comparison.
↓ = the study HS had a worse outcome.
↔ = no difference between study HS and its comparison.
√ = CTE/academic course ratio was a significant negative predictor of dropout.
[a]This row shows promotion progress results for each of three years—each year is represented by one arrow.
[b]The alignment questions from the senior survey were only asked of the study school students.

complete the pipeline activities. Despite these limitations, the actual Tech Prep structures at this site contain elements that other consortia could benefit from.

The dual credit programs at two of the three sites appeared to be successful, although they also appeared to have an inherent upper limit of participation. At AHS, students used dual credit for enrichment and credit recovery purposes. AHS exchanged student elective classes for career academy classes. Dual credit provided AHS students with the opportunity to receive both the focused career academy courses and the electives they would have otherwise missed. An added benefit was that students received college credit for those electives, and as we saw, AHS students earned significantly more college credits than C-AHS students in the time period under study. At the PHS site, dual credit was an established program that provided those same benefits to students who were ready and willing to attend a college during their high school years. Although C-PHS outperformed PHS in terms of credits accrued at PCC, students from both schools earned an impressive number of college credits while in high school. Dual credit did not have a large presence at either VHS or C-VHS, perhaps due to the loss of state funding.

At the local community colleges, we found that the majority of students from each high school needed some form of remediation. In the AHS and VHS comparisons, students needed remediation at rates similar to those of students at their comparison schools. At the AHS site, these rates were around 60%, and at the VHS site, they were over 95%. PHS students needed significantly less remediation than their comparison school students. Because PHS graduates needed so little remediation, they could directly enter into college-level courses more often.

The results of the college credit and GPA analyses were mixed, although AHS and PHS students appeared to have made a good start in their college careers, earning significantly more credits than their respective comparison group students. VHS students continued to struggle, earning a similar number of credits but a significantly lower GPA than their comparison group counterparts.

Finally, mention must be made of some of the predictors of these results. The predictors were for the most part not significant, or else they painted a mixed picture. However, an incipient pattern emerged around Latino students at the PHS and VHS sites. There were large numbers of Latino students in the 11th-grade cohorts at both of these schools (43% and 48%, respectively; see Chapter 2). We have seen that at PHS, Latino students were significantly less likely to report being accepted to college, and a low percentage of Latinos in the PHS class of 2002 attended PCC. Regardless of whether they attended PHS or C-PHS, significant numbers of Latino students who attended PCC needed some form of remedial coursework, compared to other ethnic groups. Similarly, at VHS and C-VHS, Latinos were significantly more likely to need some form of remediation.

According to the NELS:88 data, Latino students who attend postsecondary education are more likely to begin at a community college than any other type of institution (Adelman, Daniel, & Berkovits, 2003). It is imperative that Latino students be prepared to succeed in college-level work when they reach college, in order to close the achievement gap. Even if this was not explicitly articulated in the career-based reforms these schools implemented, it was an important goal for these schools as well, as the qualitative data presented here aptly demonstrate. The results outlined here show that the schools at the PHS and VHS sites need to redouble their efforts in this regard.

Overall, the results are quite mixed. Patterns are difficult to discern. The specific context of each of the study schools becomes important to understanding these results. A qualitative lens can help explain the outcomes and help us understand their seeming contradictions. In the following chapter, we provide the context that can help shed light on these results.

CHAPTER 4
CAREER-BASED COMPREHENSIVE SCHOOL REFORM: QUALITATIVE OUTCOMES

Few patterns were discernible from the results reported in the previous chapter. This was true within each case comparison as well as across cases. In fact, because the reforms and the contexts in which they were implemented differed so much from each other, we will continue to report each case separately. The present chapter uses the qualitative data—based on four years of site visits, interviews, and classroom observation—to help explain some of the outcomes. First a general description of each school is presented, and then we integrate the results of the qualitative analyses for each case into the quantitative results of the previous chapter.

Fostering a Culture of Success: The Role of Academy Middle School and the Urban Learning Center at AHS

The current site of Academy Middle School (AMS) and Academy High School (AHS) was once solely a middle school whose faculty and principal envisioned a K-12 unit under the aegis of the Urban Learning Centers (ULC) reform design. Some of the middle school teachers moved into the high school to teach, but many of the original movers and shakers continued to teach in the middle school after the facility's transition to being a K-12 school.

While one of the reform tenets of ULC is for schools to develop according to their own needs, ULC implementation specialists encourage strong connections across the elementary, middle, and high school levels. One example of this is that subject departments (e.g., math, English) from both AMS and AHS meet together. Teachers of a certain subject from both the high school and middle school meet as a group to decide upon issues common to the entire span of students in middle and high school.

Each year, one classroom's worth of sixth graders enters AMS from Academy Elementary School (located down the block from the middle and high school facility). The rest of the students come to AMS from other local elementary schools. A middle school math teacher reported that many students come in under grade level:

> *Academic teacher:* When I first got here, one of the big problems I encountered was students coming to us with very low skills. Some of them in 7th grade could not even multiply, could not do the simple addition of decimal numbers and all the skills they needed to move on and be able to do Algebra and Geometry.

After several years, this teacher asked the principal if she could "loop" with students, i.e., teach the same group of students in both 7th and 8th grades. Sometimes, this teacher noted, it took more than a year for a student to show progress, and having the same teacher through that process could be helpful. The principal agreed, and the teacher praised the administration for supporting such ideas to help students learn. The teachers who looped students back through another year also felt that they understood their students better and that they bonded with the parents better. Teachers were able to introduce Algebraic concepts in 7th grade instead of in 8th grade.

In addition to looping students through the same teacher for two years, AMS began to use the Accelerated Math program to get students up to grade level before high school. Accelerated Math lets students know which areas they are weak in, and it can set up a program to target those areas. Some teachers used it purely for intervention, after school or on Saturdays. Other teachers used Accelerated Math in the classroom to teach a particular skill. In those cases, students had an individualized practice set to work on; no practice set was the same. In the classroom, some teachers used Accelerated Math for the entire two-hour teaching block, with the teacher acting as coach, walking around ensuring student progress. Other teachers preferred direct teaching, and they used Accelerated Math for the homework assignment, which could then be corrected using a scanner.

School administrators appeared to be satisfied with Accelerated Math:

> *High school administrator:* The beauty of it is, especially from Algebra on up, it helped us explain why some kids take tests and maybe get a B on every test, then fail the course or fail the final. Because if you're getting a B and you get 80%, that means that you don't know 20%, and that 20% accumulates each time. And Accelerated Math catches that, because it keeps throwing back objectives or skills you don't know. So even though a student might be taking a test on these kinds of equations, an Accelerated Math test will throw back something they did not master before that they should have been practicing. It would be very hard to individualize like that with 32 students manually.

The math teachers we spoke with, both at the middle school and the high school, seemed equally content with Accelerated Math. One told us, "The key to it is the teachers doing the teaching for any idea or concept the kid does not know, and a proper orientation [i.e., attitude] by the kid. . . . And that's why we have seven Geometry classes [in middle school]."

Other interventions at the middle school included intensive after school, Saturday, and intersession classes. As a school on a year-round schedule, the Learning Center divided students into three groups who attended school at staggered times during the calendar year, thus relieving overcrowding. Each group of students attended school for four months, then were on a two-month intersession, during which time they could take classes. There was no three-month summer vacation for students.

It took dedication on the part of the AMS staff to provide such intensive intervention. One middle school teacher explained his motivation:

> *Academic teacher:* With Geometry, it's the first part of senior high school, where they have to repeat classes that they aren't successful in. It takes awhile for that to sink in and to get the energy directed towards the subject matter. And many students are slow at doing that. And that's why I'll teach two intersessions at the same time. I'll stay until four o'clock in order to do that because the student needs to be reinforced, and reinforced, and encouraged to be a student, which in my estimation is just spending some time and en-

ergy into learning and remembering what we're trying to teach them.

Of course, students also had to show dedication. The student we shadowed in middle school described some of the expectations he had to meet in order to achieve his long-term plan of attending AHS and a four-year college:

> *Seventh-grade cohort shadowed student:* There was a lot of stuff going on [at AMS], with all the Saturday school and the mandatory tutoring and stuff.
>
> *Researcher:* Tell me a little bit about the process of applying to the high school here. What did you and your parents have to do?
>
> *S:* Work a lot. Like, I had to bring my math grade up to—well, I brought it up to a B. So I mean, just going to intersession and you know, just different things like that.

A final intervention available to qualified students at AMS and other neighborhood middle schools was a university enrichment program. Each year, a nearby private university accepted applications from sixth graders for this intensive academic enrichment program. Each participating middle school could have one classroom's worth, or 30-35 students. Participants were selected based on elementary school grades (C average or higher) and teacher recommendations, rather than by test scores. Student applicants could not have a high absentee rate or major behavior problems. As one middle school teacher described it:

> *Academic teacher:* It's not a gifted program, it's a motivated program. And as a rule, we get the more accomplished students. It originally really started out to be, take at-risk kids who are C students and make them A or B students. And we've kind of gotten away from that. Part of it was practical. Every kid at this school would be considered at-risk. . . . However, if you look at their state test scores, they are not 90th or 80th percentile. I think it's a little bit more accurate to look at those scores. But we don't look at their test scores to get them in, just grades and teacher recommendations. And they're all usually nice, enthusiastic kids.

The AMS student we shadowed participated in the university enrichment program and appeared to respond well to the high expectations:

> *Researcher:* Tell me the best aspect of the school.
>
> *Seventh-grade cohort shadowed student:* We got good teachers here. And the way they expect a higher level from you. Like, since I was in the university enrichment program in 8th grade, I was doing 9th-grade work, you know, while I was doing 8th grade work. I guess you could say the program is a step ahead. That's what it seems like to me: they expect more out of you and that's good because it's going to push you.

Getting Into Academy High School

As noted above, AMS students had to apply to attend AHS. The application requirements were that students had to be promoted from middle school, parents had to attend a meeting to hear about the expectations at AHS, and students had to write a paragraph about why they wanted to attend AHS. Students interested in participating in intramural athletic programs were informed that AHS was too small and too new to be able to compete in the district league. These requirements tended to self-select for motivated, generally well-behaved students with caring parents. Students who fulfilled all of the application requirements were selected by lottery to attend AHS.

The university enrichment program continued at AHS. Again, one classroom's worth of students (i.e., approximately 35) could continue in the program in high school. Students who participated in the university enrichment program at AMS were also automatically accepted into AHS. However, not all of these students chose to apply to AHS. Some students wanted to experience another school, since many had been at the AHS site since elementary school, and others did not desire the career academy high school experience.

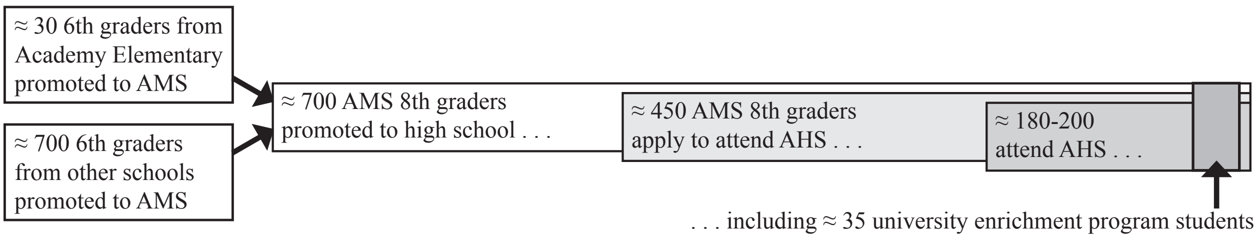
The grades and performance of university enrichment program students were reviewed every year, especially the year between middle and high school. If these students were making adequate progress, they were automatically eligible to attend AHS. If their grades, attendance, or behavior had lapsed, they would be removed from the university enrichment program, and would then be eligible to apply to AHS like any other AMS student. The 8th grade students we interviewed were very aware that without the university enrichment program, their chances of attending AHS were slim, since the waiting list to attend AHS was very long. These were difficult decisions for 8th graders to have to make, prompting one to say:

> *Seventh-grade cohort student (in 8th grade):* For me, I'm really giving it a thought, whether I want to stay here or if I want to go to another school to get a different education, because it's hard [here]. It's going to be a lot of pressure here, but I guess I would be willing to take it. . . . You have to really make sure to look into the high schools and what they're doing and what are they teaching. Because if we get out of the university program right now, we're one year ahead of everybody in the 8th grade. So if you want to apply to another high school, you have to really make sure that they're up to your level and that they're doing things we're doing right now. That's why I want to start going to different high schools to see what programs they offer.

This discussion raises the issue of whether AHS was "creaming" the best students from AMS to attend the high school. In an urban area where almost all students are at risk of not succeeding in school, the ULC reform design begins with children in elementary school and provides them with the expectations and academic support that they need in order to ultimately attend four-year colleges and universities. Academy Elementary School had one classroom of students per grade (approximately 30). This was the number of students per AHS graduating class who could conceivably have experienced the entire ULC K-12 reform. AMS received those 30 students in 6th grade, as well as 700-800 others from nearby elementary schools. Thus 96-97% of every entering 6th-grade cohort at AMS was made up of non-ULC students. About 35 AMS students, or 4%, participated in the university enrichment program starting in 7th grade. All students took Algebra in 8th grade, and there were several classes of Geometry at AMS as well.

Of the approximately 700 8th grade students who were promoted from AMS to high school each year, about 450 applied to attend AHS. From those, 180-200 were accepted (26-29% of each cohort). Fewer than one-third of each middle school class, therefore, was able to attend AHS. Note that the 35 university enrichment program participants were included in this count, making up 17-20% of each incoming freshman class. The remaining 80% of the students were not in the university enrichment program, but had had the ULC middle school experience that included high expectations and the support to meet them (see illustration below).

Figure 2
The AHS pipeline



One AHS administrator responded to the charge of creaming: "We get kids who might have a 25th percentile on the state test score. They might have a fail in Algebra. You know, they might have a fail in English. But we do a lot of intervention." This support continues throughout high school as long as students remain motivated. Another administrator reflected on the university enrichment program students:

> *High school administrator:* [These students] become a core of kids that other kids see as being successful, and wanting to learn, and learning, and doing what they're supposed to do. . . . So they help form a culture of success. As I say to the faculty, "Look, these kids can learn and they're the same kids. So we can model some of that same program so that we can duplicate it with other kids." And that became something we tried to use to change the culture of the school.

It was part of a coherent reform design strategy that the ULC continued to support students who stayed at the school for grades K-12. While this may favor certain students, it is also true that high-achieving students chose to attend other high schools. It could also be argued that the loss of such human capital was a drain to the ULC and helped increase student achievement levels at the other high schools that those students attended, including C-AHS.

The Role of Academy High School

Being an Urban Learning Center meant that AHS and AMS worked together to develop collaborative, articulated communities across grades. Such vertical alignment was evident in the work of the math department. One example of this collaboration was described to us at the beginning of the study. Teachers in the math department had not been satisfied with the results of that year's state test scores. They analyzed the data and identified areas of student deficiency. As one administrator described it:

> *High school administrator:* The goal was to put together an intervention program for these kids because they were not passing the state test just on our own curricula and what we were doing in the classroom. And so [the math teachers] did that together. I would have thought this was something the high school teachers needed to do, but they went to the middle school teachers, and the middle school teachers are doing the intervention, which was after school and on Saturdays. And that was such a good plan that they did, in that these middle school teachers then are seeing where the weaknesses are, after so many years of instruction, these kids are still weak in this area. So it's altering some of their instruction that they do in the classroom and that was intentional.

The school provided staff development based on teacher needs. One high school math teacher attended workshops on literacy in math, because he felt that AHS students' literacy and language levels prevented them from scoring higher on external math exams. AMS math teachers were able to benefit from such staff development opportunities as well.

The ULC focus on ultimately attending four-year colleges and universities meant that by high school, many students had a sophisticated understanding of college entrance requirements. This focus was directed not only to the university enrichment program students, but rather, the culture of success was promulgated throughout the school. One of the high school students we shadowed, who was not in the university enrichment program, knew what she had to do in order to meet her goals:

> *Ninth-grade cohort shadowed student:* Besides grades, colleges look at different things, like sports, extracurricular activities, and required classes. Like, you have three years of math: Algebra 1, Algebra 2, and Geometry. But instead, I'm taking Math Analysis and I plan to go to Calculus. So, the more you go [up the math sequence], it's better. I guess two more [math classes for me]. And instead of you looking for them [colleges], they'll look for you.

Career academies also became part of the AHS reform efforts. However, the specific careers offered were less important than other aspects of the career academy structure to the AHS principal who implemented the academies:

> *High school administrator:* I believe in the academy model because I like the smallness and the connectedness. I love the teaming. I don't care about the theme. The theme to me is not as important as the teaming and the smallness and the understanding. That is much more vital to me. That is much more real than anything else.

How Achievement Happens at AHS

Engagement

We saw in Chapter 3 that the AHS attendance rates were significantly higher than those at

C-AHS. Because so many AMS graduates attended high school at C-AHS, the drop in attendance and work habits when AMS students moved to C-AHS was well known to AHS students, teachers, and administrators. One follow-up had been conducted prior to this study, in which the attendance of AMS students at C-AHS was tracked. By 10th grade, student attendance had dropped. An AHS administrator opined, “[Students] get into a culture of, ‘I don’t have to go to school,’ or whatever. But it’s the same kids who came to school every day [at AMS] and then in two years, it just dips.”

One possible explanation for the higher attendance at AHS could be the career academy structure. As shown in previous studies (Kemple & Snipes, 2000; Orr et al., 2002), career academies provide students with a high school experience characterized by a core group of teachers dedicated to the academy, scheduling that keeps students in a cohort, classrooms and resources exclusively for academy students, and connections between the school and a career area that students themselves have selected. All of this is designed to engage students and keep them attending classes. In addition, AMS students had already begun to be groomed for success in high school and beyond. The combination of the two reform efforts—ULC and the career academies—appeared to have helped AHS students remain engaged in high school in greater numbers than C-AHS students.

Learning Math at AHS

Data from classroom observations confirmed that the academic press in AHS math classes was strong. Students paid close attention during math, and teachers were prepared with work that appeared to challenge them. Table 68 presents data on mean student attention rates at set time intervals in observed classes (see Chapter 2 for a description of these observations). More detail on the data can be found in Appendix C. Table 68 shows that AHS students had higher attention rates in math classes than during any other type of class observed, and that those rates were significantly higher for math than for CTE classes. In fact, student engagement in math classes was so high as to approach the upper limit of the effective use of time range of 78-93% that previous research has found to be associated with gains in student achievement (Brophy, 1988; Stallings, 1980).

Table 68
Student attention rates, AHS, mathematics classes and other classes

	Math Classes			*Other Academic Classes*			*CTE Classes*				*All Non-Math Classes*		
Student Attention	N *Obs*	N *Int*	*Mean (SD)*	N *Obs*	N *Int*	*Mean (SD)*	N *Obs*	N *Int*	*Mean (SD)*		N *Obs*	N *Int*	*Mean (SD)*
Overall mean	4	36	93.33 (10.58)	13	109	87.84 (12.85)	8	66	74.44 (8.44)	*	27	216	83.51 (13.23)

Note. Obs = Observations. Int = Intervals.
**p* < .05.

Table 69 records the extent to which various pedagogical practices were used during the class, where 0 = no use, 1 = some use, and 2 = extensive use. Means were calculated for the use of each practice in various subject areas. On a scale with a highest score of 2.00, the mean score for providing student feedback was significantly higher for math teachers (1.75) than for CTE teachers (0.88), and than for the other non-math teachers we observed (0.96, see Table 69). Additionally, our classroom observations logged significantly more instances of "teacher acting as coach" in math classes (1.75) than in the other academic classes (0.73), the CTE classes (0.63), and the overall classes we observed (0.68).

Table 69
Pedagogical practices, AHS, mathematics classes and other classes

	Math Classes		*Other Academic Classes*			*CTE Classes*			*All Non-Math Classes*		
Pedagogical Practices	N *Obs*	*Mean (SD)*	N *Obs*	*Mean (SD)*		N *Obs*	*Mean (SD)*		N *Obs*	*Mean (SD)*	
	0 = None, 1 = Some, 2 = Extensive										
direct instruction by teacher	4	1.75 (0.50)	12	1.17 (0.72)		8	0.75 (0.71)	*	26	1.00 (0.75)	
independent work by students	4	1.00 (0.82)	12	1.17 (0.72)		8	1.38 (0.52)		26	1.19 (0.63)	
teacher provided feedback	4	1.75 (0.50)	12	1.00 (0.74)		8	0.88 (0.64)	*	26	0.96 (0.66)	*
students engage in relevant dialogue	4	1.00 (0.82)	12	1.08 (0.29)		7	1.14 (0.38)		24	0.92 (0.50)	
sustained writing	4	0.50 (0.58)	12	0.75 (0.75)		8	0.50 (0.54)		26	0.50 (0.65)	
computer use	4	0.00 (0.00)	12	0.08 (0.29)		8	0.63 (0.92)		26	0.27 (0.60)	*
use of other technology	4	0.00 (0.00)	12	0.17 (0.39)		8	0.00 (0.00)		26	0.19 (0.40)	*
hands-on learning	3	0.67 (1.15)	12	0.25 (0.62)		8	0.63 (0.74)		26	0.38 (0.64)	
challenging activities	4	1.75 (0.50)	12	0.92 (0.67)	*	7	0.71 (0.76)		24	0.79 (0.66)	*
alternative assessment strategies	3	0.00 (0.0)	12	0.00 (0.00)		8	0.25 (0.46)		25	0.12 (0.33)	
teacher acted as coach/facilitator	4	1.75 (0.50)	12	0.73 (0.79)	*	8	0.63 (0.52)	**	25	0.68 (0.63)	**
discipline problems	4	0.00 (0.00)	12	0.33 (0.49)		8	0.63 (0.52)	*	26	0.38 (0.50)	**

Note. Obs = Observations.
*$p < .05$. **$p < .01$.

Examples of teachers acting as a coach were found in our classroom observation running notes, such as a Geometry teacher who worked with students until they understood:

> The Geometry teacher worked with each student until he or she got to the answer, instead of saying, "Nice try," and letting someone else complete the problem. For example, she called on one boy who did not want to go to the board. She told him, "Go ahead, we'll help you, you can do it." Then she did probe the boy as he wrote down the proof. She did this throughout the class, never leaving a student until s/he came up with the correct answer. She also allowed other students to help in the same way.

A Math Analysis teacher was described by one observer as a drill sergeant, spending part of the two-hour block calling out exercises and terminology loudly from the board while students responded freely. He worked the students, but then gave them a breather: "Let's stand up and stretch. Hurry up. We're going to cover something else and I need your brains fresh." The student we shadowed in this class called his teaching style fun.

Other results from the classroom observation data showed that, compared to CTE classes, math classes contained significantly more direct instruction (1.75 vs. 0.75) and significantly fewer discipline problems (0.00 vs. 0.63) (see Table 69). There was no use of computers or other classroom technology observed in any of the math classes, unlike in the rest of the classes observed. It appeared from the observations as though most math instruction took place traditionally: from textbooks, homework, and classwork on the board. Finally, AHS math classes were found to provide challenging activities significantly more often than the other academic classes observed at AHS (1.75 vs. 0.92).

Learning in the CTE Classroom

The CTE classroom observation data suggest that students had significantly lower attention rates during CTE classes (74%) than during academic classes (89%, see Table 70), and compared to all other class time intervals (i.e., including electives, 88%). Moreover, the mean student attention rate for CTE classes (74%) did not meet the 78-93% range considered to be effective use of class time.

Table 70
Student attention rates, AHS, CTE classes and other classes

	CTE Classes			*Academic Classes*				*All Non-CTE Classes*			
Student Attention	N *Obs*	N *Int*	*Mean (SD)*	N *Obs*	N *Int*	*Mean (SD)*		N *Obs*	N *Int*	*Mean (SD)*	
Overall mean	8	66	74.44 (8.44)	17	145	89.13 (12.27)	**	23	196	88.37 (12.74)	**

**p < .01.

In terms of classroom orientation, our observations found that significantly fewer CTE classes were teacher-led than academic classes (29% vs. 54%, see Table 71). And indeed, our observations showed that CTE classes tended to be less regimented than academic classes. In their career academies, students often worked in teams on projects. These teams came to class ready to continue that work, and did not need additional instruction from the teacher. Sometimes, these projects took students out of the classroom. For instance, students in one academy were creating video documentaries. Part of this project involved filming various aspects of their high school experience, as well as learning the technicalities of creating video documentaries (e.g., edits, voice-overs, etc.). Such a class assignment seems much more likely to lead to off-task talk than perhaps a lecture on creating documentaries or a math lecture. However, in order to learn how to create a documentary, students must be allowed to create documentaries. Teamwork and other skills develop as students choose a project, distribute the work, and create a product. The opportunities to learn provided in such class environments are not as well captured in time interval increments, but they are integral aspects of CTE instructional practices nonetheless.

Table 71
Classroom orientation, AHS, CTE classes and other classes

	CTE Classes			*Academic Classes*				*All Non-CTE Classes*			
Classroom Orientation	N *Obs*	N *Int*	*Mean (SD)*	N *Obs*	N *Int*	*Mean (SD)*		N *Obs*	N *Int*	*Mean (SD)*	
Percent of observation that teacher led instruction	8	66	0.29 (0.22)	17	147	0.54 (0.29)	*	23	198	0.53 (0.33)	
Percent of observation where team teaching occurred	8	66	0.00 (0.00)	17	147	0.00 (0.00)		23	198	0.00 (0.00)	
Percent of observation where students worked individually	8	66	0.45 (0.35)	17	147	0.31 (0.32)		23	198	0.35 (0.31)	
Percent of observation where students worked in small groups	8	66	0.29 (0.39)	17	147	0.12 (0.15)		23	198	0.09 (0.14)	
Percent of observation where students worked in pairs	8	66	0.01 (0.04)	17	147	0.09 (0.19)		23	198	0.06 (0.16)	
Percent of observations where students led instruction	8	66	0.02 (0.05)	17	147	0.06 (0.19)		23	198	0.04 (0.16)	
Percent of observation that was media led	8	66	0.00 (0.00)	17	147	0.02 (0.06)		23	198	0.06 (0.12)	*
Percent of observation that focused on projects	8	66	0.26 (0.39)	17	147	0.06 (0.24)		23	198	0.04 (0.21)	

Note. Obs = Observations. Int = Intervals.
$^*p < .05$.

Integrating Math or Science with CTE

Integrating the high school math or science curriculum into the career academies was not part of the career academy design at AHS. Instead, English and social studies classes were integrated into the academies. When AHS designed its career academy program, the specific careers to be offered were less important to the stakeholders than the small learning communities and opportunities for teacher teaming that academies afforded. Career academies at AHS provided an organizing structure for smaller learning communities, and they introduced students to a career area, but the primary focus of AHS was solid preparation to move on academically.

In addition to not being part of the academy design, there was little time to develop the "horizontal alignment" between math and science and CTE subject matter at the high school level. Much "vertical alignment" was constantly occurring between the math and science teachers at AMS and AHS, and teachers were busy with the various interventions to get or keep students at grade level. None of the career academy teachers we interviewed worked with their math or science colleagues. One academy teacher said that the students were at very different levels in their math progress, making classroom integration difficult. Other teachers noted that math was used in academy classes to create budgets and graphs, and to perform calculations, but they presented such math topics themselves.

The situation was similar for science. Like the math department, middle and high school science teachers met as one department. Their focus was on curriculum, state standards, and student achievement. While the graduation requirement for science was two years, students wishing to apply to the state's top-tier university system were encouraged to take three years of science. Because AHS was a small high school, providing enough science courses at the proper levels for students was a challenge. Small courses and AP sections could be organized for students to meet college entrance requirements, but this left little time for career academy collaborations.

Dual Credit

As shown in Chapter 3, almost half of the AHS students who earned college credits while in high school subsequently attended ACC, a local community college. We interviewed ACC faculty from the departments that aligned with the three career academies. One department chair, when asked to comment on course articulation, assumed we meant two-year college to four-year college articulation rather than articulation with high schools. Another chair expressed reservations about dual credit programs with high schools. From previous experience with a program where college faculty taught classes at the high school, he concluded that the high schools in this city did not have the resources to teach at a postsecondary level: "This was a chalkboard classroom. To get the overhead projector, you had to reserve it. I was shocked. Delivery clearly is not the same as what we deliver here." He also doubted high school students' ability to comprehend the high-level vocabulary in certain texts, "unless there was some kind of pre-requisite check that maybe they are part of an AP course."

One student we spoke with had taken a chemistry class at a community college:

Researcher: Were the classes harder than you expected?

Ninth-grade cohort student (as a senior): The chemistry was, but I liked it because I felt that in a way it was preparing me for college. I didn't have, 'Where's your homework as-

> signment?' Everything was turned in online and wow, teachers lecture. He doesn't give you worksheets to practice. You have to go home and actually study. He didn't care if it was a weekend. You have to turn in your homework at Saturday, 3:03 p.m. He said at that time. I really struggled through that. I think it's a totally different experience, that chemistry class, but I think it was great. I really learned a lot.
>
> *R:* But you haven't taken anything since?
>
> *S:* No. I would never recommend it to anybody who's not ready to do that. Some students, they have to go to outside to make up their courses. You don't make up courses of that intensity somewhere else. At a high school, the teacher's there, you have her 24 hours, but college, it's like, wow, you need to get [phone] numbers from your peers, see who understands it, and get together. It was hard.

AHS collected information each year on the college plans of every student in the graduating class. For our 11th-grade cohort, 95% of the students planned to go to college: about 60% to four-year universities, and 35% to community colleges. These figures match up well with our senior survey (63% and 37%, respectively, cf. Table 14). The top students received scholarships, but for those who did not, attending a university was an expensive prospect. Some of the students we spoke with at ACC admitted that their high school GPAs were not "high enough," and they chose ACC so that they could "get a taste of what college is like," and "work [their] way in." These seem like rational decisions given their circumstances. As far as this study was able to follow their post-high school transition, AHS graduates appeared to have internalized the culture of achievement that was fostered at AMS and AHS. They demonstrated this by planning to attend four-year universities in large numbers, and, for those attending ACC, earning significantly more credits than C-AHS graduates (cf. Table 23).

Our interviews with AHS graduates helped us understand the implications of the high expectations that AHS and the students themselves held: Qualified urban students must still find the financial means to attend college. Despite the push to attend a four-year college, many of these graduates were realistic and wanted to see what college was about before making the significant financial investment of attending the state university system. Meanwhile, ACC had a strong academic reputation, a high transfer rate, and strong programs in the AHS academy areas. Indeed, each of the AHS graduates who attended ACC that we spoke with reported that they intended to transfer to the state university system. They did not "end up" at ACC, but very purposely sought it out:

> *AHS student #1:* I came here to just get a feel for college. I knew I wasn't ready for a university yet. And I just didn't want to rush into it.
>
> *AHS student #2:* I came here for financial reasons, because I don't have much money right now to pay for college.
>
> *AHS student #3:* I chose it for the same reasons. I haven't decided on my major yet, so I thought it would have been a real waste of money to go to a large college and change my major three years in.

Postsecondary Transition at AHS

ACC's facilities reflected its location and reputation: There were several impressive new complexes for business administration, technology, and the library. There were few traditional occupational programs left at ACC when we first visited in 2000. On a tour of the campus with the dean of business and industry programs, we saw a photography lab that had been transformed into a digital photography program with computer stations instead of darkrooms. Traditional occupational programs had been phased out in favor of what the dean called the "more glamorous" programs, such as Microsoft certification programs, and an Academy of Entertainment Technology.

Remediation

Despite the strong academic preparation at AHS, AHS graduates needed remediation at the same rates as C-AHS graduates. We spoke with some AHS graduates, several of whom admitted that they had not taken the ACC academic placement tests seriously. One student also reported that he had not taken math during his senior year and had forgotten "everything":

> *AHS student:* I mean, Algebra was way back then. That was what? Eighth grade? Ninth grade? So it was basically like, I didn't remember. That's all it was. That's why I did bad on it, because I didn't take math senior year, and I didn't want to [take math] because I didn't want to stress myself out. You know, I made the choice, I live with it, and I don't mind working my way up again. I know I can do it once I'm in the class again.

This student reminds us that the traditional math sequence beginning with Algebra is being introduced at younger grades. This means that when students take community college placement tests, which tend to be Algebra-based, many students have not had Algebra for four years. Even students who take math during their senior year might not receive enough practice in the relevant Algebraic procedures to perform well on an Algebra-based test.

AHS Summary

We have shown that the academic press was strong at AHS, especially in math. This strong academic orientation was reflected in the math results, where AHS students outperformed C-AHS students. Interestingly, since all AMS students were groomed for the strenuous college preparatory curriculum of AHS through at least middle school (through the vertical alignment of curriculum and the various support programs brought about by the Urban Learning Center K-12 reform design), those C-AHS students who had also attended AMS—our comparison group—continued to perform on par with AHS students in other academic subjects such as science. AHS students had better attendance and similar dropout rates. We conclude that the rigorous middle school experience students received at AMS, including a strong academic base, good study habits, articulation of personal expectations, and general buy-in regarding school, helped students through high school, regardless of what high school they attended.

The postsecondary transition results showed few differences between the AHS and C-AHS groups who attended ACC. Because we did not collect qualitative data at C-AHS, it was not possible to know the motivations behind C-AHS students' choices and outcomes after high school. With respect to AHS students, it was beyond the scope of this study to examine those AHS students who attended other colleges and universities. However, it is instructive to note that the AHS students who attended ACC self-identified as having lower GPAs than their peers, being less sure of their goals, and lacking the financial resources to attend four-year universities. Therefore they may not be as representative of the entire cohort as the 63% who planned to attend four-year universities.

Convincing Students of the Value of Education for All Careers: The Role of Pathways Middle School and the Career Pathways Curriculum Delivery Model at PHS

Students at Pathways Middle School (PMS) were aware of the career pathways organization at PHS because of the collaboration across schools in this district. Teachers from all three middle schools participated in professional development with the staff of the high school around career pathways. Perhaps because PHS was the district's only high school, it was district policy to make teachers and students at all levels aware of the pathways.

When we asked about the role that the middle school played in career pathways, PMS teachers and administrators pointed to several activities and programs. First, PMS offered a selection of elective classes such as Woodworking and Family and Consumer Science. One administrator described the agriculture-based community that expected these sorts of classes:

> *Middle school administrator:* I'm not talking just about migrant workers. I'm talking about people who are landowners and have farms. They expect to have an Industrial Technology class here. Their kids are comfortable in that kind of an experience, and that's an important value.

There was also a Tech Lab class that consisted of modular computer stations such as aeronautics and robotics, which introduced students to the work of various engineering careers. Its teacher organized her class like a workplace, where students had a contract with a deadline at each station: "They need to meet that contract because there's contract penalties and those run into millions of dollars sometimes [in the workplace]. So it's very important that they don't miss deadlines, that they know how to manage time."

The academic classes at PMS also integrated career pathways into their curricula. For example, there was a "World of Work" unit developed by a language arts teacher. This unit included a thorough examination of income and expenditures for a single person living in an apartment, making minimum wage. When this low standard of living had been made clear to students, the importance of education was discussed. Guest speakers talked about various careers, and students prepared resumes. They participated in mock interviews, took interest inventories, wrote thank you letters to the guests, and researched a career as part of this unit.

Extracurricular activities at PMS also supported career pathways. For instance, all 8th graders went through a food handlers' license program. This was a performance-based exam in partnership with the county health department. The license would last two years, long enough for students to gain work experience in church or youth group concession stands. In fact, the introductory support for career pathways at PMS was so strong, that the staff had begun to hear suggestions to reduce it:

> *Middle school teacher:* In my science classes, we talk about the different opportunities in the field of science, and what kind of level of education you need to get there. And that way they can start thinking about it but without feeling a lot of pressure. We were getting feedback that the kids were a little young to be hitting them too hard and they were just burned out by the time they got to high school. Students, parents, and even some of the teachers at the high school were saying, "What are you doing to those kids? By the time they get here, they don't want to hear any more."

The administration at PMS was also aware of the need to raise academic achievement to state-mandated standards. In 2002, they felt that eliminating career awareness activities and Industrial Arts classes in order to do that was a mistake. This study's focus on PMS ended in 2002, as most members of our 7th grade cohort were promoted to high school that year. We do not have any more recent information as to whether the pressure to increase academic achievement caused PMS to scale back its strong commitment to career awareness and introductory support of career pathways.

The Role of Career Pathways in the High School

At PHS, career pathways were conceptualized as a curriculum delivery model. At the end of 9th grade, students chose from five pathways: Arts and Communication, Business and Marketing, Engineering and Manufacturing, Environmental and Agricultural Science, and Health and Human Services. Most students were familiar with the careers associated with these pathways through the career awareness activities that took place at all of the middle schools. Each pathway was further introduced to freshmen through a two-week curricular unit in a related department.

After the two-week pathway introductions, there was no more formal career pathways content in academic classes. Instead, after students chose a pathway, that pathway became expressed in the electives that students chose to take. Students gained experience in their pathway by choosing from the many elective options at PHS, such as CD-ROM Authoring, Sports Medicine, Drama, and Accounting. Students could also attend the regional skills center for more concentrated CTE programs such as Early Childhood Education.

The goal of the career pathways was to provide focus and direction to an otherwise often disjointed high school experience. Freshmen appeared to understand this purpose:

> *Ninth-grade cohort student #1:* You pick your pathway and go towards that. Some pathways you only need probably three years of math and another pathway might need all

four years of math. And that's probably why they have it.

Ninth-grade cohort student #2: It helps you get at your jobs better or faster or easier.

Ninth-grade cohort student #3: Yeah. Because you might not take those classes.

S #1: It kind of shows you what level you need to meet to be in that kind of career.

S #3: Yeah. It shows you what classes to take.

A sophomore student from a later cohort confirmed this purpose for career pathways:

Seventh-grade cohort student (as a sophomore): [Career pathways] really helped me decide what I wanted to do because before, they asked me, "What do you want to be when you grow up?" and I would say, "I want to be a teacher." But now that I think about it, and now that I've been in the Business and Management pathway, I want to be a bank teller. You don't know what you want to be until you research it because I didn't know how many years of college, and how much you get paid to be a teacher. But now that I looked up bank telling and accounting, I'm sure that's what I want to do.

One important component of the career pathways curriculum delivery model was integrated projects. Each grade level had a project to complete. All grade-level projects included writing components of various genres (e.g., budgets, thank you letters, research reports). Freshmen used knowledge acquired in three classes to participate in a rescue simulation called Team Rescue. Sophomores volunteered for a service learning project of their choice, preferably related to their pathway. Juniors participated in a week-long business simulation activity. Seniors were required to complete a senior project that included a product or performance, a related research paper, and a short presentation. The projects were done in consultation with relevant faculty or community members, who also judged the senior projects. The senior project was expected to be in an area related to a student's pathway.

Situating career pathways in the elective classes meant that PHS had to offer a wide array of electives. Many of these electives were CTE classes. PHS offered many appealing CTE options, such as building a house that was completed, landscaped, and sold in the same year. The proceeds went into a non-profit fund that purchased land and materials for the following year, but also gave scholarships to the students who had participated. The other traditional shops such as automotive and sheet metal did authentic work, providing auto repair and producing trailers, swing sets, and even boats for the community. An administrator commented on the advantage of the hands-on learning provided at PHS:

CTE teacher: Remember PT [Power Technology]? The science component of shops, the science of engineering? It was the "answer" to the shops. Get rid of the shops and you can teach PT and those things. And that program, quite honestly, didn't work. Kids weren't interested in it. I mean, you put a $30,000 boat over here and let me tell you what: Kids are interested.

How Achievement Happens at PHS

Engagement

We saw in Chapter 3 that the PHS attendance rates were generally lower than those at C-PHS. PHS administrators recognized that absenteeism was a problem with varied causes. For example, one PHS administrator acknowledged that there were students with 60% absentee rates: "And to a great part, these are cultural issues. . . If [the family] needs assistance at home with babysitting and so forth, the children stay home and help the families." School-based activities also took time away from the classroom. One PHS administrator felt that students were out of class too much: "They do so many activities outside of classrooms. Not only sports activities, but performing groups, the junior class project takes a week, and the state test takes eight, ten days." In fall 2002, the PHS statistics class designed a survey to determine the freshman failure rate in math as a class project. Students collected and analyzed the data, and concluded that low student attendance was the primary cause for the large number of failures, rather than student ability levels.

Career pathways were implemented at PHS in 1998 in part to address a high dropout rate. One district administrator described the thinking at the time:

> *District administrator:* We were having kids drop out, I can't remember the rate. But between 8th and 9th grade, and then again between 9th and 10th, there was a large dropout rate. We knew that's where we needed to start and we came to consensus that we needed to focus on 9th grade first.

Anecdotally, we heard from several stakeholders that the majority of PHS dropouts were male, Latino, and often nonnative speakers of English. Many of these students would reach a point in their high school careers, we were told, when the English vocabulary involved in higher-level concepts became very challenging for them, leading them to drop out. Other Latino students, who were the undocumented children of migrant families, would discover that regardless of their efforts to succeed in school, they would have to pay out-of-state tuition at any public colleges or universities in the state. This financial hurdle led some students to reconsider postsecondary education or even finishing high school at all, according to one administrator. As another put it:

> *High school counselor:* Those are kids that were low-income, high-risk, and their families needed money. And if they're 15 or 16 years old, and they're not getting A's and B's in school, a lot of their parents are saying, "You may as well drop out and go get a job, and help me pay the bills."

Indeed, the district data from the 9th-grade cohort shows that each year, the majority of the students who were coded as dropouts or status unknown from PHS were Latino (see Table 72). However, the same is true of C-PHS—the vast majority of its dropouts were also Latino. The Latino dropout rate appears to be a systemic problem affecting both schools. Because PHS is a larger school, more students were affected there.

Table 72

Gender and race distribution of dropouts for PHS site, 9th-grade cohort

Dropout by Gender and Race	*PHS (N = 528)* N	%	*C-PHS (N = 368)* N	%	
Dropped out	74	14.02	15	4.08	*
Female	35	47.30	8	53.33	
Male	39	52.70	7	46.67	
Asian	1	1.35	0	0.00	
African American	2	2.70	0	0.00	
Latino	59	79.73	12	80.00	
White	12	16.22	3	20.00	
Unknown	85	16.10	29	7.88	*
Female	35	42.17	14	48.28	
Male	48	57.83	15	51.72	
Asian	0	0.00	0	0.00	
African American	8	9.41	0	0.00	
Latino	55	64.71	24	82.76	
White	20	23.53	5	17.24	
Total Dropout Status and Unknown	159	30.11	44	11.96	*
Female	70	44.59	22	50.00	
Male	87	55.41	22	50.00	
Asian	1	0.63	0	0.00	
African American	10	6.29	0	0.00	
Latino	114	71.70	36	81.82	
White	32	20.13	8	18.18	

*$p < .05$.

Learning Math at PHS

Our observations of the math classrooms at PHS revealed a mixed picture: students appeared to pay less attention in math class than in all other classes, but challenging activities and student engagement in relevant dialogue were more common in math than in other classes. The mean student attention rate for math was significantly lower than for all other types of classes observed (see Table 73). Indeed, the math attention rate did not approach the 78-93% range that has been associated with student achievement gains and effective use of class time (Brophy, 1988; Stallings, 1980). The entire results are presented in Appendix C.

Table 73
Student attention rates, PHS, mathematics classes and other classes

	Math Classes			*Other Academic Classes*			*CTE Classes*				*All Non-Math Classes*		
Student Attention	N *Obs*	N *Int*	*Mean (SD)*	N *Obs*	N *Int*	*Mean (SD)*	N *Obs*	N *Int*	*Mean (SD)*		N *Obs*	N *Int*	*Mean (SD)*
Overall mean	5	41	67.39 (14.03)	11	83	79.97 (15.28)	13	105	85.82 (11.73)	*	26	202	81.53 (15.47)

Note. Obs = Observations. Int = Intervals.
*$p < .05$.

Despite the finding that student engagement was lacking in math classes compared to other classes at PHS, our observations also revealed that students engaged in relevant dialogue and took part in challenging activities significantly more often in their math classes than in their other academic classes (see Table 74). On a scale with a highest score of 2.00, the mean score for student participation in relevant dialogue was significantly higher in math classes (1.40) than in other academic classes (0.13), and than in all other classes observed (0.35). Additionally, the math classes we observed included challenging activities significantly more often than the other academic classes did (1.20 vs. 0.29).

A closer look at the classroom observation data suggested that the lack of attention paid in math class was occurring predominantly in the low-level Technical Math classes (analyses not shown). Teachers described these classes as "a dumping ground" for students who had "bombed out of traditional math." In separate Technical Math class observations, two different observers noted:

> The teacher said that he expected all students to complete the assignment by the end of class. However, he allowed one student to sleep at her desk with her head down throughout the assignment. He told me that his students could handle a maximum of five minutes of lecturing and then they must be involved in hands-on learning, or he would lose them. I think he may be selling the students short.

and:

> These kids could achieve at substantially higher levels than they were. They were moving forward at a negotiated pace, while maximizing socialization and/or sleep.

Conversely, the following excerpt from an observation of a Geometry class reflects the kind of dialogue and challenging activities that went on at the post-Algebra levels of math at PHS. Here, the teacher used the previous night's homework to discuss and solidify those concepts. She then presented new material and gauged student understanding. When she sensed that students were struggling with the concepts, she tried to have some students explain it to others. This type of dialogue required students both to understand it themselves and to put it in words that their peers could understand as well:

Table 74
Pedagogical practices, PHS, mathematics classes and other classes

Pedagogical Practices	Math Classes N Obs	Math Classes Mean (SD)	Other Academic Classes N Obs	Other Academic Classes Mean (SD)		CTE Classes N Obs	CTE Classes Mean (SD)		All Non-Math Classes N Obs	All Non-Math Classes Mean (SD)	
	0 = None, 1 = Some, 2 = Extensive										
direct instruction by teacher	5	1.40 (0.55)	8	1.50 (0.88)		11	0.82 (0.41)	*	21	0.95 (0.67)	
independent work by students	5	0.80 (0.84)	9	1.11 (0.93)		11	1.73 (0.47)		22	1.41 (0.73)	
teacher provided feedback	5	1.40 (0.55)	8	1.00 (0.54)		11	1.18 (0.41)		21	1.14 (0.48)	
students engage in relevant dialogue	5	1.40 (0.89)	8	0.13 (0.35)	*	11	0.60 (0.70)		20	0.35 (0.59)	**
sustained writing	5	0.00 (0.00)	8	0.50 (0.93)		11	0.18 (0.41)		21	0.33 (0.66)	*
computer use	5	0.20 (0.45)	8	0.00 (0.00)		11	1.09 (1.04)	*	21	0.57 (0.93)	
use of other technology	5	1.60 (0.89)	8	0.50 (0.72)	*	11	0.82 (0.87)		21	0.67 (0.80)	*
hands-on learning	5	1.00 (1.00)	8	0.38 (0.74)		11	1.55 (0.82)		21	1.05 (0.97)	
challenging activities	5	1.20 (0.45)	7	0.29 (0.49)	**	10	1.00 (0.94)		19	0.68 (0.82)	
alternative assessment strategies	5	0.40 (0.55)	8	0.38 (0.74)		11	0.27 (0.47)		21	0.29 (0.56)	
teacher acted as coach/facilitator	5	1.00 (0.71)	8	0.63 (0.92)		11	1.18 (0.60)		21	1.00 (0.78)	
discipline problems	5	0.40 (0.55)	8	0.75 (0.89)		11	0.27 (0.65)		21	0.52 (0.81)	

Note. Obs = Observations.
*$p < .05$. **$p < .01$.

As soon as the bell rang, Ms. G asked, “How many of you thought last night’s homework was hard?” Only a few people raised their hands. Here’s an example: They were given that triangle Δ ABC = Δ TUV, and angle C = 55˚, angle U = 59˚. From there they had to figure out the dimensions of various other angles. They went over their homework. Ms. G asked a student to give the answer to the next problem. He said he had had trouble with the homework. Ms. G suggested then that he “stop slouching” and open his book and learn how. After going over the homework, Ms. G went on to the new lesson, how to prove triangles congruent using the side-side-side and side-angle-side theorems. She saw that some students were having a hard time. She explained again, and then said, “Who can explain it, with a new drawing?” Only a couple of students raised their hands. She then asked who had a pretty good idea, and several more raised their hands. She acknowledged that it was hard to articulate what was going on. Several students tried. I could tell that they were leaning forward to learn this new concept, and the engagement in the room was high. Some students were trying to put their fledgling understanding of side-angle-side into an explanation that their peers could understand.

It appears as though some of the low-level math classes traditionally offered at PHS placed low expectations on students, which not surprisingly resulted in low student attention rates. However, there was a concerted effort at PHS to increase expectations in order to meet state accountability requirements. When the 9th-grade cohort began high school (2000-01), Technical Math was a low-level math option. By 2002-03, PHS had done away with the Technical Math series in favor of a two-tiered freshman Algebra program. All but the very lowest-ability students were placed in Algebra.[7] Some students took a standard, year-long Algebra course, and some students took a two-year version (that covered first-year Algebra content over two years), but all incoming freshmen were expected to take some form of Algebra.

The push to take Algebra in the freshman year enlarged the pool for high-level math. Staff at PHS encouraged students to take more and higher levels of math, and administrators claimed that they were offering more sections of advanced math than in previous years. They often attributed this success to parent outreach, which was an integral part of the career pathways model. One community volunteer we spoke with described registration evenings, where parents approved their students' course choices:

> *Community volunteer:* With parents of sophomores, we're talking about staying in math and science. We're equating that to being on a football team. You want to play football in college, you wouldn't think of not playing football your senior year because you need a break. You want to be able to compete at the next level. So the outcome of that is that Mom is saying, "I don't care if it's an elective. You're staying in math."

A math teacher described parent outreach at a different level:

> *Academic teacher:* It helps when I call parents. "Did you know your child opted not to take a math course next year? Do you know how detrimental that is?" You know, I can't call all of them, but when I see kids that I had as 9th graders, bright 9th graders, thinking they're going to take their senior year off from math, I get on the phone.

We believe that low-level math courses had to have had a lingering effect on overall math achievement, which, as we saw in Chapter 3, was not significantly different from the comparison school. It appears as though the message of staying in math throughout high school was not reaching all students.

Data from the classroom observations revealed no practical differences between the science class time intervals we observed and any other academic class time intervals in terms of

7 The very lowest achievers were placed in a two-hour math and literacy block for their freshman year.

student attention or the pedagogical practices elicited on the observation form.

Learning in the CTE Classroom

The CTE classroom observation data suggest that students were very engaged in their CTE classes. The overall mean student attention rate was significantly higher in CTE classes (86%) than in academic classes (74%) (see Table 75). Student attention in CTE classes was squarely in the 78-93% range considered to be effective use of class time. The entire results are presented in Appendix C.

Table 75

Student attention rates, PHS, CTE classes and academic classes

	CTE Classes			*Academic Classes*			
Student Attention	N *Observations*	N *Intervals*	Mean *(SD)*	N *Observations*	N *Intervals*	*Mean (SD)*	
Overall mean	13	105	85.82 (11.73)	17	129	73.92 (17.48)	*

*$p < .05$.

High student engagement in CTE classes is not surprising, since CTE classes are electives, and we can assume that if students choose to take CTE classes, it is out of interest. However, it seems unlikely that this was the sole reason for these results. Our classroom observations at PHS point to certain pedagogical practices that were significantly more prevalent in CTE classes than in academic classes—these practices might also have contributed to the high levels of student engagement in CTE classes. For instance, CTE classes were characterized by significantly more independent work, more use of computers, and more hands-on learning than non-CTE classes (see Table 76).

It is not difficult to imagine that such practices would make CTE classes engaging to students. During our yearly visits, we observed or heard about students building small trailers, aluminum recreational boats, and, the largest project, a house that was built and sold in an academic year. PHS also offered many computer-based CTE courses, such as Computer Engineering, AutoCAD, and a co-op Office Education course. But in addition, we observed computer use in other CTE classes, such as Auto Mechanics: the shop had an adjacent classroom with computers at each student desk. Students were expected to go through curriculum units, such as how to use a hoist, in PowerPoint independently before performing the process in the shop.

Despite this, the results in Chapter 3 show that PHS students earned fewer CTE credits than C-PHS students. There is nothing in the qualitative data to explain this, aside from the broader fact that PHS students failed to earn enough credits overall—both CTE and academic—to be promoted and to graduate on time.

Table 76
Pedagogical practices, PHS, CTE classes and other classes

	CTE Classes		Academic Classes			All Non-CTE Classes		
	N	*Mean (SD)*	N	*Mean (SD)*		N	*Mean (SD)*	
Pedagogical Practices	0 = None, 1 = Some, 2 = Extensive							
direct instruction by teacher	11	0.82 (0.41)	14	1.14 (0.77)		15	1.20 (0.78)	
independent work by students	11	1.73 (0.47)	15	1.00 (0.85)	*	16	1.00 (0.82)	*
teacher provided feedback	11	1.18 (0.41)	14	1.14 (0.54)		15	1.20 (0.56)	
students engage in relevant dialogue	11	0.60 (0.70)	14	0.57 (0.85)		15	0.53 (0.83)	
sustained writing	11	0.18 (0.41)	14	0.36 (0.75)		15	0.33 (0.72)	
computer use	11	1.09 (1.04)	14	0.07 (0.27)	**	15	0.07 (0.26)	**
use of other technology	11	0.82 (0.87)	14	0.86 (0.95)		15	0.87 (0.92)	
hands-on learning	11	1.55 (0.82)	14	0.57 (0.85)	**	15	0.67 (0.90)	*
challenging activities	10	1.00 (0.94)	13	0.62 (0.65)		14	0.64 (0.63)	
alternative assessment strategies	11	0.27 (0.47)	14	0.36 (0.63)		15	0.33 (0.62)	
teacher acted as coach/facilitator	11	1.18 (0.60)	14	0.79 (0.80)		15	0.87 (0.83)	
discipline problems	11	0.27 (0.65)	14	0.71 (0.83)		15	0.67 (0.82)	

Note. Obs = Observations.
*$p < .05$. **$p < .01$.

Integrating Math or Science with CTE

Curriculum integration was a key part of the career pathways reform at PHS. When the staff had originally planned to create an integrated set of courses for the freshman year, they had wanted to integrate business with English and perhaps history. However, they found that those academic departments were not interested in curriculum integration. As one administrator put it:

> *High school administrator:* You can't shove something at somebody if they're saying, "No way." It takes too much energy. . . . We had this motto, "Don't water the rocks."

> You work with the people who are really excited. And that's what we did and it just kept growing. It started out with a kind of core, about 25% of the faculty because they were desperately looking for concrete ways to reach these kids and keep them in school and help them decide what to do with their lives.

Teachers from the science, health, and business departments were the first to be interested in developing integrated projects. Teachers were given common planning time to develop curriculum and monitor student progress. The flagship project was called Team Rescue, which culminated with students working in teams to respond to a mock bus accident. In their science class, students learned how to use a compass, which they needed to find their "victim" on Team Rescue day. In health, students learned first aid and became certified in CPR. In Computer Literacy, a business course, they learned to keyboard and how to write about the experience in several different genres. All students were to write a paper describing how long it took to find their victim and what kind of first aid they administered. The Team Rescue project involved the entire community: emergency responders from the fire department helped stage the mock accident on the PHS football field and worked with the student teams to verify their diagnosis and "treatment" of their victim, PHS drama students and community volunteers played victims, and counselors were on hand to help students who had been in accidents or who might have emotional reactions to the exercise for other reasons.

We observed Team Rescue day one year. Our observations describe some students who were not able to find the victim assigned to their team or who were unsure of the proper first aid:

> The first step was to navigate with a compass to find their victim. The students [I observed] had great difficulty doing so and ended up picking out the victim closest to them in the hopes that she was lying in the correct coordinates. It turned out that she was indeed their victim. As I listened, I was shocked at how little the students seemed to know. They were quite at a loss as to how to treat their patient, and what symptoms the victim was displaying. When the students finished with their diagnosis, they signaled a paramedic to come over, who asked them similar questions as those on their assignment sheet, for example, "What were her vital signs? Does she have diabetes?" The students' responses were a mix of correct and incorrect answers. The paramedic explained the symptoms and treatment to the students. They were quite engaged in this conversation and seemed genuinely interested in what the paramedic had to say.

Most students we spoke with enjoyed the activity. Most students did not become re-certified in CPR when their initial certification lapsed, however. But we heard, from both students and teachers, of several occasions in which students used the first aid they had learned. One student was credited with saving a life when a citizen collapsed in the street in front of him, and he performed CPR until the paramedics arrived.

After several years of conducting Team Rescue, some teachers and administrators became concerned that the activities did not have a strong enough connection to curriculum content and standards. They felt that the time could be better spent preparing students for the state test. As our study came to a close, a committee of staff and administrators was re-visiting Team Rescue to see how it could be better integrated into the state curriculum frameworks.

The other instances of academic and CTE curriculum integration were isolated. Many CTE teachers we spoke with said that they did their own integration, bringing in math or another academic subject as necessary. They felt that students needed to learn such subjects in an applied manner. But they rarely worked with academic teachers to integrate that content. None of the academic teachers we spoke with worked with CTE teachers on curriculum integration. PHS' administration held out curriculum integration as a goal, but one that had not yet been realized.

These findings are consistent with other studies of curriculum integration. Johnson et al. (2003) found the definition of *curriculum integration* to be sufficiently vague as to render its measurement nearly impossible. They argued that school structures such as career pathways ought to facilitate integration but our findings suggest that pathways are not a guarantee of sustained curriculum integration.

Graduation

The district data showed that PHS students from the 9th-grade cohort were significantly less likely to graduate on time than C-PHS students. We turned to our qualitative data to attempt to explain this finding, since we had hypothesized, as had many at PHS, that PHS would have higher graduation rates than high schools that had not implemented career pathways. The assumption was that career pathways were a means of organizing high school that helped all students understand the importance of finishing school, regardless of their anticipated career trajectories.

PHS did not have a policy of social promotion. There were set numbers of credits associated with each high school grade level, and students who had not earned the minimum number of credits to advance to the next grade did not advance.

> *High school administrator:* And because we are promoting by credit, you don't become a senior until you're within firing range with the credits. We have a pretty good-sized chunk of kids who started as juniors, didn't make up the credits they were supposed to make up, so that becomes the reason they're not looking at an on-time graduation.

Students were aware of this policy as well. When we last spoke to our 7th grade cohort shadowed student, he was a sophomore:

> *Researcher:* We always ask you this every year. You thought a lot of your friends might not finish high school, do you still feel that way?
>
> *Seventh-grade cohort shadowed student (as a sophomore):* Yeah. A lot of my friends are still freshmen.
>
> *R:* How did that happen?
>
> *S:* They just slacked off. They didn't want to work.

Students who needed to make up credits had several options for doing so: summer school classes, evening classes, and credit recovery classes using an online individualized curriculum system called NovaNET® (Pearson Digital Learning, n.d.).[8]

PHS had one more graduation requirement than C-PHS and most other high schools in the state: PHS students had a senior project requirement as part of the career pathways reform design. The senior project was multi-faceted. Students had to create a product or performance related to their pathway. A ten-page research paper on the topic of the project was also required. Finally, students were to give a short presentation to an audience of teachers and members of the community, who judged the work.

If students did not complete the senior project, they were unable to graduate. Many students complained about this, because they knew that neighboring high schools did not have this requirement. However, PHS students were supported throughout the senior project process. Students had advisors who monitored their progress. Some students told us that they had begun their projects during their junior-year English class. In addition, PHS faculty and administrators had found that students who had trouble completing the senior project were also students who had had trouble earning enough credits to graduate, so stakeholders did not feel that the senior project requirement was driving down graduation rates.

When we asked students if they thought their friends would graduate, only one mentioned the senior project as a factor. Instead, most students we spoke with thought that those who would not graduate had disengaged from school, causing them to not earn credits in a timely manner. "Half of them don't even show up to high school," said one student. "They don't feel the need to wake up in the morning and—it's like, 'Screw it. I'm just going to stay home today.'" Such student attitudes towards attending and finishing high school, as reported by PHS students and staff alike, had led to significant dropout rates that career pathways did not appear to be reducing.

During the duration of this study, the state began to standardize how districts reported their dropout rates, in accordance with the *No Child Left Behind* (NCLB) legislation. High schools were required to report their dropout rate, defining the graduating cohort as all incoming freshman students from four years earlier. This definition significantly raised the dropout rate at PHS, because, like many high schools, PHS had only been reporting a senior year dropout rate.

In addition, a report had been released containing high school dropout rates from across the state, using not only the four-year cohort, but also classifying all students of unknown status as dropouts. This led to surprisingly high dropout rates across the state. PHS had a 47% dropout rate by that definition. One school board member observed:

> *School board member:* We do know that we are at a higher level than some of the other districts. We know there are factors that mean that we have a higher rate of dropouts, and

8 The NovaNET teacher told an observer with some pride that, of the approximately 275 students who graduated in 2003, 145 of them (53%) had used NovaNET to earn credits.

> we need to address those. I don't know what we can do about the poverty. Because statistically, they say kids who come from houses that are in that poverty level are much more inclined to drop out.

PHS stakeholders also took issue with another aspect of the new NCLB accountability measures: only four-year graduates could be counted in the graduation rate. If a student took an extra summer or a fifth year to complete high school, they had to be counted as a dropout. This was antithetical to the ethos at PHS, as described by one administrator:

> *High school administrator:* We try intentionally to keep kids until they're 21 if they don't have the foundational skills. And we're one of the few school districts who do that. There's nothing magic about 18 years of age. A lot of times it's a language barrier or it's an abuse situation. We have kids that live out of their cars. . . . Our goal has always been to have a kid graduate, whether it takes them four-and-a-half or five years. That's our goal, is to turn out a student that can further fulfill their job aspirations, whether it be the military, a trade school or JC, university or college. If it takes four-and-a-half years, we're happy with that. Sure we'd like it in four, but let's get with the real world, and our real students, who go out and work and come to evening school. Whatever we can do to keep them in school, to work around their work schedule. That's why it's frustrating at times with the accountability factor, and yet telling a kid, "I want you to stick with us. We'll do what we can." Knowing that's going to count against our graduation rate. But we've chosen, so far, to stick with that student and say "Okay, it's going to take you four-and-a-half. Let's get it done."

This administrator recognized that such accommodations could adversely affect the school's graduation rate. The state appeared to recognize this as well, cautioning readers of the state report to bear in mind, as they compared high school graduation rates, that districts that helped dropout students return to school could incur lower on-time graduation rates than they would otherwise.

PHS impressed the research team as a very accommodating high school that would work with students to help them to graduate. It might take attending the evening school, receiving special language help, or spending extra time on the NovaNET system. It might take more than four years, but PHS did not give up on students.

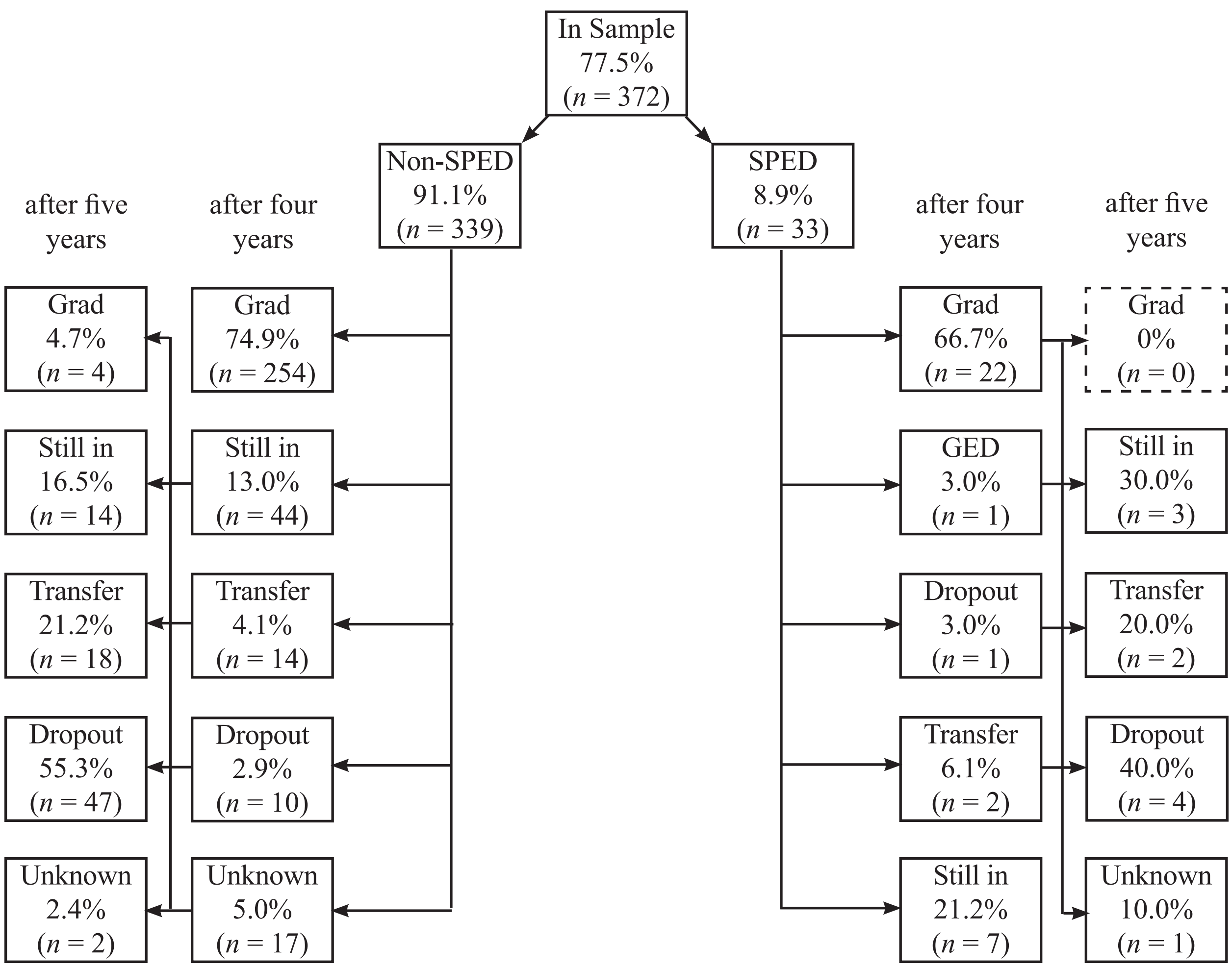
However, the five-year graduation rate for the 11th-grade cohort at PHS (the only cohort for whom such data were available) did not reflect that hard work on the part of students and staff that we heard described. Figure 3 presents a schematic of the students in the 11th-grade cohort.[9] This sample was split into special education and non-special education students. The trajectory for the latter group is shown down the left-hand side of the schematic, in two columns of possible outcomes. The rightmost of these two columns presents the outcomes for students at the end of four years; the leftmost column has student outcomes after five years. The first box in the Year 4 column

9 The total in the grade cohort was about 25% larger than the study cohort. In the complete schematic (not shown), the trajectories of these other students are also depicted. These would include students who were really 10th graders in terms of credits, and students who had transferred out of PHS during the study period and so were not members of the sample (see Chapter 2).

provides the number and percentage of students who graduated in four years (254, or 75% of the sample). Of the 25% who did not graduate, 44 students (13%) were counted as attending PHS for a fifth year. The top box in the far left column shows that only four more students had graduated by the end of that extra senior year, adding just one extra percentage point to the graduation rate. Fourteen others were still persisting by the end of that fifth year, but most of the rest were coded as dropouts. The right-hand side of the main branch of Figure 3 shows that none of the special education students in the 11th-grade cohort who remained at PHS a fifth year graduated that year.

The new definitions of high school completion and dropout and methods of calculating them did not favor PHS. But a state plan to implement a high-stakes test that would be required for graduation threatened not only to send PHS dropout rates even higher, but also the very concept of career pathways. Teachers and administrators alike opined that when the state test, which high school sophomores already took, became a graduation requirement, "We're going to see a

Figure 3
Outcomes trajectory, PHS, 11th-grade cohort



lot more dropouts than we've ever seen before." PHS stakeholders were monitoring events in other states as their high-stakes test came online, and they tried to prepare for their own looming deadline. Such preparation necessarily meant focusing on the 9th and 10th grades, to prepare students to pass the test. Some administrators broke ranks with the career pathways focus and moved towards other, more academically-based blocks of time for student learning:

> *District administrator:* One of the discussions we've had about the high school is that, all 10th graders have to take a test. And it will be part of graduation requirements. So don't the first years really need to focus on that academic piece, and the second two years is a different picture. You know, it is maybe more career pathways-specific.

Another administrator commented on the consequences for CTE:

> *District administrator:* The pendulum right now is clearly swinging over to the academic side in response to the state test becoming a high school graduation requirement. The CTE community is very concerned that we're not looked upon as a part of the solution with the high-stakes testing. Even though we teach those skills that are tested, I think everyone is just scared silly about the focus on academics at the current time.

It appeared as though the career pathways curriculum delivery model had not improved student graduation rates. The 9th-grade project had integrated academic and CTE curriculum, but in a marriage of convenience of willing teachers and departments rather than a research- or curriculum-based integration. Our observations of the main project, Team Rescue, revealed that many students took advantage of the time out of the classroom to socialize and did not take the simulation seriously. Meanwhile, accountability requirements were increasing, which led some PHS administrators to call for changes to the integrated projects. These changes would allow for larger blocks of time to prepare for the state tests in math and English, which were scheduled to become graduation requirements.

Tech Prep

Chapter 3 showed that PHS students from the class of 2002 passed more Tech Prep courses and earned more Tech Prep credits during high school than C-PHS students from the same year. Students from both schools took many articulated CTE courses at their respective regional skills centers. These centers offered more comprehensive, half-day CTE programs that were often easier to align with college programs than high-school-based CTE courses. Administrators at the skills center that served PHS reported that 80% of their programs were articulated with the community college. The PHS students we spoke with who had attended this center said that they had earned 7-24 college credits through programs such as Welding, Dental Hygiene, and Computer Systems Technology.

With such an inexpensive means of earning college credits available to students, we wondered why more students did not take advantage of it, especially since many more students took the articulated CTE classes than received the college credit. Various teachers and administrators at the high school and college provided several reasons. First, many students did not reach the proficiency level in order to be eligible for college credit. In some cases, the high school class was not able to cover all of the material. One high school CTE teacher commented that if she had the class do group activities, for example, she had to forfeit a required unit for articulation. She also reported that one of her goals was to diversify the class, and that many English language learners had a difficult time with the reading. She slowed down the pace of the course so that students could master concepts, but this meant that they would not be able to pass the test for direct Tech Prep credit.

Other students reached the required competency level but neglected or could not afford to pay the fee. Although it was a nominal fee that did not even pay for the program administration, for many low-income families, the fee was prohibitive. Finally, for the class of 2002 and prior, students were required to have a social security number in order to accrue the credits. This disqualified undocumented students, many of whom took CTE classes in high school but found themselves unable to take advantage of transition opportunities such as Tech Prep.

Dual Credit

Although PHS students did not earn as many dual credits as students at C-PHS did, both cohorts earned a substantial number of credits that they took with them to community college (see Chapter 3). Given the apparent success of the dual credit program, we asked students and administrators why more students did not take advantage of this opportunity. At both the state and school levels, administrators we spoke with felt that the dual credit program appealed most to high school students who were average to above-average achievers but were socially disengaged from high school and would not miss the dances, sporting events, and other social activities that make up high school life. Indeed, some parents were enthusiastic when they heard about the program, because of the money they could save on their child's college education. But there was often resistance from students, who did not want to spend their senior year at a college; these students wanted to be with their friends at the high school.

Among the students we interviewed, most did not participate or plan to participate in dual credit. Most gave the same reason: They wanted to enjoy their high school years. As one student put it, "I don't want to grow up too fast. You're only in high school four years, so enjoy it while you're at it, and then go do the college thing." Another student was advised by an older sibling not to participate, because it could adversely affect his high school GPA. The sibling had tried a dual credit program but found that the homework load was too heavy. He had also found it too difficult to arrive back at the high school on time for his classes there. Finally, a third reason we heard was that the credits earned would only be accepted by state colleges and universities. If a student planned to attend an out-of-state institution, Advanced Placement courses were preferable to dual credit.

Postsecondary Transition at PHS

PCC was established in the mid-1950s. Its sprawling campus offered 20 professional and technical programs in 2001, most of which terminated in an associate of applied science degree.

PCC had up-to-date facilities for its occupational programs and worked closely with the regional vocational skills center so as not to duplicate facilities. CCC is located in a town near the small city in which C-PHS is located. Because C-PHS students had to travel in either case, many preferred to make the longer drive to PCC, which offered a wider range of programs.[10]

Alignment Between High School and College Course of Study

In our interviews with PHS graduates attending PCC, we asked whether the career pathways had helped them make decisions about their post-high school options. From conversations like those we cite here and the fact that most students we spoke with remained in their career pathway, we concluded that the career pathways experience had influenced their decisions.

Many of the graduates we interviewed had had some idea of their career interests before choosing a career pathway in high school. In such cases, the career pathways experience at PHS often refined their thinking:

> *PHS student #1:* Going into high school, I already knew what I wanted to do, and then the test that we took just pointed me in that direction, and confirmed that I'd be good at that. Because that's what I like to do.
>
> *PHS student #2:* I kind of knew what I wanted to do because everybody in my family is a teacher, and so I thought, well I like that. But doing that [senior project] just pushed me a little bit more into whether I like this age group more than the other.

Interestingly, some of the graduates did not see their college major as aligned with what they were doing in high school. For instance, one student had been interested in welding at PHS, so he joined the Engineering and Industrial Technologies pathway. He thought he would become a welder, but upon further examination, he decided to go into fire science and become a firefighter:

> *PHS student #3:* There's a welding program here at PCC. But I started looking at the lifespan of welders and it's usually about 40, because it's a dangerous job. And I just changed my mind and that's why I am not too happy about the pathways, is here I've got four years of welding, three years were advanced welding. And I had fun and I liked doing that stuff, but it's more of a hobby now than it would be a job. Because I want a job that I can just sit at the fire station and watch TV and then get called out to fires and be expected to work. But I also wanted to be compensated for my work and be able to support a family with good benefits, and that was important to me. This (firefighting) is a good career to be able to do if you want to have a family.
>
> *Researcher:* And you didn't see welding in that light?
>
> *S #3:* Well a lot of welders that I've known, they travel all over the world. If they're good welders, they travel. They can be on the east coast one weekend, and then the west coast the next. I didn't want to be chasing jobs. I want to be able to get up and stay in one place. I don't want to have to move my family for a job.

10 Demographic information on these community colleges can be found in Appendix C.

It is important to note that although this student no longer wanted to be a welder, he worked part-time in a garage, in a job that included welding, and this job was paying at least in part for his college. Perhaps this student did not see the value of his pathways experience because he no longer planned to enroll in the welding program at PCC. Also important to note in this student's case is that his new career choice, firefighting, could fall into the same pathway of Engineering and Industrial Technologies.[11] It appears as though this student made an informed decision when he changed direction, based on his own research. We know that an explicit component of the career pathways model was to provide students with the skills to research careers so they could make such informed choices. In this sense, the career pathways model helped this student choose his college major and career direction, and financially support that choice.

However, since some PHS graduates did not seem to feel that the career pathways model had helped them, the researcher probed these students to see if career pathways could be improved in any way so as to help students reach better decisions. Two students suggested postponing the choice of career pathway:

> *Researcher:* What might have they done that might have made this work better for you?
>
> *PHS student #4:* Maybe not have us get into a pathway our freshman year.
>
> *PHS student #5:* You're just trying to get situated, because you're the low person on the totem pole. You're still trying to figure out where you want to go, you know, you're so worried about who you're hanging out with.

The one student whose PCC major was not aligned with his pathway agreed:

> *PHS student #4:* We took a survey in our freshman year and that seems like we're too immature to make those decisions yet. Our interests probably change between freshman and senior year, so maybe start doing that [pathways] in our sophomore year. I just didn't like how they wanted you to pick a career. I knew maybe I'd go into teaching, but I also wanted to think about other things. And so I think they should probably just stay out for a while. Like, how many people change their majors a million times in college, and they're asking you to pick what you want to do in high school, freshman year. I had no idea.

This student had been in the Engineering and Industrial Technologies pathway at PHS. He was taking general studies classes at PCC in order to transfer to a four-year university and eventually teach and coach in high school. He concurred with many students we spoke with, that perhaps choosing a career pathway was best done later in students' high school careers. That sentiment was certainly echoed by some school and district administrators (see above), who were looking at the academic benchmarks that students had to meet by their sophomore year. Some of these administrators had broached the subject of delaying some career pathways components until after students took the state high-stakes tests in math and English.

Student trajectories are complex. We spoke to students who had changed their majors due

11 As noted above, career pathways have been defined in various ways. In some typologies, firefighting would be in a human services pathway.

to changes in their lives. Such changes reflect the fact that high school reform can only influence lives up to a point, and that there are many forces external to school that influence student career and life choices. Other graduates failed to see the relationship between their career pathway at PHS and their current work and educational pursuits, demonstrating that the perceptions of the influence of high school reforms will also vary. In sum, measuring the influence of career pathways by following students' next steps remains an imprecise pursuit.

Remediation

As noted, PHS graduates at PCC needed significantly less remediation than students at C-PHS (see Chapter 3). Among the 15 PHS graduates whom we interviewed at PCC, about half of them required no remediation at all. Among those who did need remediation, such coursework was often required in mathematics. One student noted that she had gotten up to Trigonometry in high school but had tested into Basic Algebra in college. She claimed that she "just froze on the test." Regardless of the reason for her performance, it is common for students who reach the higher levels of math in high school to require remedial math in college. In a national study of high school and postsecondary transcript data from approximately 9,000 students known as the National Education Longitudinal Study of 1988 (NELS:88), it was found that over 20% of students who took Algebra 2 or lower in high school still required at least one remedial math course in college (Adelman et al., 2003). Even among those students who reached Trigonometry in high school, over 10% required college remediation in math. This is a nationwide phenomenon, but overall, the rates at which PHS students needed remediation were much lower than those of C-PHS students.

PHS Summary

The results for Latinos at PHS merit further discussion, especially at graduation and beyond. The Latino population at PHS was significantly less likely to graduate than White students (see Table 33). The senior survey self-report data tell us that Latino students were only about half as likely to report being accepted to college as White students (see Appendix, Table B15). There was no significant difference in the background characteristics of PHS graduates who reported planning to attend a two-year college (see Appendix, Table B18). However, the PCC data show that 64% of the PHS graduates who attended PCC that year were White, while only 28% were Latino (see Appendix, Table A10).

A closer look at the remediation data from PCC shows no significant differences across student background characteristics, regardless of high school attended, with the exception of English remediation (see Table 43 and Appendix B). In English, Latinos were more likely to need remediation than students from other backgrounds.

While the Latino and LEP populations are not one and the same at PHS—the city had an East European immigrant population that was also LEP—the majority of their non-English speaking population was in fact Latino. These outcomes hearken back to the above discussion of high school dropouts, in which some PHS administrators felt that because many Latino students had not mastered English well enough to achieve academically at grade level, they were dissuaded from attempting postsecondary education and pursued other options. Indeed, one can see that significantly more Latinos chose to enter the military than did students from other backgrounds (see Appendix, Table B14). Those Latino students who did graduate and chose to attend PCC were more in need of remediation in English than other PHS graduates.

Unfortunately, prior achievement scores were not available at this site, limiting our ability to explain the results further. But it is clear that all of the reform elements at PHS—the career pathways, the support from the middle schools and the community, the grade-level projects at the high school, the engaging CTE options, the comprehensive guidance plan, and the many partnerships—had not greatly improved student achievement or retention, especially for its large Latino population. As this study came to an end, PHS was considering focusing the first two years of high school on academics and on passing the state tests, which would soon become graduation requirements. The last two years of high school could then become the time when students focused on career pathways and postsecondary trajectories.

Working to Make the Grade: The Role of High Schools That Work and State Intervention at VHS

Before embarking on its reform agenda in the mid-1990s, VHS was in danger of losing its accreditation. Adult authority had broken down, gang members openly sold drugs on the school premises, and teachers reported fearing for their safety. In 1994, new leadership came in and succeeded in making the school a gang-neutral place where young people could learn. This involved arresting some gang members and suspending some students. The leadership team also tried to instill a sense of pride and respect in the students, to build the culture that the staff wanted to see at VHS:

> *High school administrator #1:* And so then we went as fast as we could to build the culture of Vocational High to compete with the gangs. That's why we did community service. They had to succeed in something. I'd get on the intercom and I'd say, "Voc High students are like this." And they'd all laugh.
>
> *High school administrator #2:* She would say, "Look at what a good job you did." And you know, the more she said that, the more that began to really show up.
>
> *A #1:* I'd say, "Did you know Johnny X went out and helped so and so? Congratulations to you." And kids would think, "Oh I know him." I was setting an image of what I wanted the kids to be. And then I was proving to them that some of them could do that. And so then more and more of the kids would do it. And finally the kids stopped laughing.

VHS was the only vocational high school in a district with three other high schools and a policy of high school choice. Middle school counselors were known to recommend VHS to students with either low academic ambitions or low prior academic achievement, including a disproportionate number of the district's special education students. Unlike our other two research sites, where the middle schools anticipated their respective high schools' expectations, in this case, the middle school influence did not seem to include a positive orientation towards education, whether academic or vocational. Yet due to its status as the only vocational high school, VHS attracted a waiting list of students, including those interested in the CTE programs offered there, and those who were uninterested in the college preparatory curriculum at the other high schools.

The vocational mission at VHS required a significant allotment of time to CTE programs. The number of days of instruction per school year was the same at VHS as at the other district high schools—180. But at VHS, half of those 180 days were spent in vocational programs, and the other half of the school year was spent in academic classes. This meant that VHS students spent 90 days learning Algebra, compared to 180 days at the other high schools. Historically, such a vocational high school had been viable, but VHS students were unable to meet present-day state academic performance standards. In addition, over the years, such a schedule that short-changed academics became a self-fulfilling prophecy, attracting low-achieving and poorly motivated students.

Because so many students came in below grade level, the goal became to get them to grade level in the first year, and graduate them within five years. Students coming in at the lowest levels of mathematics and reading achievement were placed in a team-taught integrated program known as the Prep School, where they learned the basics in classes that included much support, some computerized instruction, and integrated activities. As soon as the students were proficient enough to move into grade-level classes, they did so, even mid-year. Of course, not all 9th graders were able to advance. Every year, a significant portion of the freshman class had to repeat 9th grade. These students were placed in another program that offered a regimented last chance at success, including daily attendance checks.

A major thrust of the VHS reform agenda was membership in the High Schools That Work (HSTW) network, which advocates rigorous academic coursework for CTE students, including integrated curriculum (see Chapter 1). As part of HSTW, VHS added higher-level academic courses and also targeted students who were coming into high school below grade level for extra support. They formed teams to work on various aspects of the HSTW reform (i.e., curriculum integration, staff development). They determined that dividing up the large high school into smaller learning communities would be helpful, and began to form a pilot learning community with a set of academic and CTE teachers.

As our study began, VHS seemed on the cusp of academic improvement: the school environment had been cleaned up, HSTW had been in place for several years, the staff seemed energized by integrated projects with purpose and value outside of school, and the programs implemented to bring students up to grade level seemed well-thought-out. But VHS had an appointment with destiny, in the form of school accountability. Its state test scores were among the lowest in the state, and had not improved over the early years of the test's administration (see Table 77).

Table 77
State test results: VHS, C-VHS, district, and state, 1999-2005

	State Test	*Percent of Students Passing*						
		1999	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*
Mathematics	VHS	3	5	11	8	37	54	43
	C-VHS	9	17	26	38	40	65	48
	District	17	24	35	36	47	61	54
	State	47	55	75	75	79	85	86
English	VHS	10	6	18	24	56	60	58
	C-VHS	29	36	54	68	57	74	71
	District	40	39	50	36	66	71	70
	State	68	66	81	86	89	89	90

The Arrival of High-Stakes Testing

When the state began to develop its school accountability system in the 1990s, it piloted exams based on state standards and frameworks. VHS students did not take these pilot tests seriously. Few students attended the exam, and scores were low. Teachers reported to us that students came to the exam, filled in their names, and proceeded to sleep on their desks. One student described her experience with the test in its early years:

> *Eleventh-grade cohort shadowed student:* I took it but I just wrote anything that came into my mind. For trying, you get points, so I just tried.
>
> *R:* Do you think that your coursework here prepared you for taking the state test?
>
> *S:* No, because on the math section, they give you math problems that we never even learned in school yet. I don't even think we should have the state test. It's boring. All of the teachers don't like doing it because this is a vocational school. The other schools get prepared all year. We only have two marking periods of [academic] classes so for math, the teachers have to be speeding and some people can't keep up that fast. Like me. I can't keep up. I forget math. That's why I just fill anything in, I don't know.

At the time this student took the exam, there were no consequences for failing or failing to take it. But during the period of this study, the state test became high stakes; that is, passing it became a requirement for graduation. High school students took the state test during their sophomore year. Students who did not pass were given other opportunities to take it. There were stories in the local press about students who had taken the test multiple times but come a few points short of passing each time. Now, as seniors, they would not be eligible to receive their diploma.

Passing the state test became the prime motivator for our 9th-grade cohort, which had to pass it in order to graduate. Every student we spoke with was against the state test as a graduation requirement, calling it "stupid" to go to school for 12 years and then to have one test determine whether or not they graduated from high school. According to teachers and students, the state test became the primary reason why students were dropping out. Both academic and CTE teachers claimed that they had students in their classes who had dropped out or were considering dropping out because they could not pass the state test. CTE teachers lamented losing "easily employable" students, and all teachers commented on the stress and emotional toll that the test had taken on their students. Many students were in CTE programs that required licensure but not necessarily a high school diploma in order to work. Some students in such programs opted to drop out, take the licensure exam, and begin working. This loophole was later closed by the state.

We have no way of confirming these anecdotal accounts of students dropping out of VHS because of the state test, but we did examine annual dropout rates from VHS and C-VHS from the state department of education Web site. Table 78 lists "annual dropout rates," which include all students (Grades 9-12) who dropped out in a given school year. They are not directly comparable to our own dropout data, since we calculated four-year dropout rates for only one grade cohort. Nor are the data in Table 78 accurate reflections of the numbers of seniors who dropped out due to the state test requirement, but they are the best estimate available. Table 78 is best interpreted by noting the trend of annual dropouts at VHS and C-VHS, and noting what occurred in 2002-03, the year that the state test became a graduation requirement—a steep jump in the dropout rate at VHS. C-VHS, a college preparatory high school, did not experience such a rise in dropout rates that year.

Table 78
Annual dropout rates for VHS and C-VHS, Grades 9-12, 1999-2003

School	*1998-99*	*1999-00*	*2000-01*	*2001-02*	*2002-03*
VHS	6.4	6.2	8.7	9.5	17.6
C-VHS	7.6	6.5	7.9	5.4	5.4

Note. Source: State department of education Web site (not identified to protect school anonymity).

Although the state required students to meet an academic benchmark in order to graduate (in the form of the state test), many students, parents, and CTE teachers continued to focus on the vocational mission of VHS. One CTE teacher related a conversation he had had with a parent:

> *CTE teacher:* At open house, I had one father ask, "If my son doesn't graduate, will you still be able to get him a job?" And that says a lot. Because the graduation is not the main focus. It's, will he be able to support himself when he leaves here? We have very separate missions to accomplish here and one is preparing a lot of our students for work, and the other one is making sure that they'll be able to pass the state test requirement.

Other responses to the pressure to raise state test scores included staff development on test item response analysis, increased emphasis on academics across the curriculum,[12] and tutoring for students who needed to re-take the test. Staff and faculty felt the pressure, but students did not seem to feel it until their senior year, as graduation approached and they had not yet passed the state test:

12 In 2002, VHS instituted a writing program that was used in all CTE as well as academic classes (Collins Education Associates, 2004).

> *Academic teacher:* Two years ago, we had an after-school program here to get the kids tutoring in math or English. We were supposed to have ten students in each of our classes, and by the end of the program there were maybe five or six kids that'd show up. So the interest to improve themselves wasn't ever there. And now that it's coming to crunch time, they're all in a panic. If most of these students would just do what they're supposed to do during the regular class time, there's really no reason why they shouldn't be able to pass it. But they have attendance problems, and everything else that inhibits them from performing to the level that they could.

Despite all attempts at improvement, student test scores remained low, and in 2002, VHS was declared a school in crisis by the state department of education. There were many changes at VHS in the school year following the in-crisis declaration. Those that affected academic subjects the most were changes to the schedule that required 9th and 10th grade students to "double up" on math and English classes. In the past, students had alternated between academic and vocational cycles of ten weeks each. But VHS teachers had noted that students on the vocational cycle at the time of the state test were at a disadvantage, since they had not been in a math class for weeks. The schedule change allowed students to always be taking at least one math class and one English class. VHS went from a five-period to a six-period day to provide extra class time, and went from the ten-week to a five-week alternating cycle. In this way, 9th and 10th graders continued to take math and English even during their vocational cycle.

In addition, new leadership came in. Many of the former plans of the VHS staff began to be perceived as "extra," and outside the task of preparing students to pass the state test. There was great turmoil about the status of various reform activities, such as the small learning communities pilot, teacher common planning time, and curriculum integration. Several CTE programs were discontinued. A final casualty was High Schools That Work. In a troubled context like this, any reform effort would have had a hard time taking hold and showing results. But even before the declaration, HSTW had not engaged enough staff to achieve a critical mass for change. There were long-standing divisions between teachers at VHS, some of which we as outsiders were aware of (i.e., CTE vs. academic teachers), but some of which we were not. There were teachers committed to seeing HSTW fail if only because their nemeses supported it. Given this kind of opposition, HSTW was never fully implemented. Even among HSTW supporters, after the in-crisis declaration, HSTW was not seen as a means of accomplishing their goals, but as an extravagance. One administrator noted:

> *High school administrator:* It's [HSTW] one more thing to do. I don't have time to do this. It's important but so are these kids here. Fifteen seniors out of my twenty are not going to graduate because they haven't passed the state test. You know, what is the priority, is it High Schools That Work and moving the curriculum forward, or work on professional development, or working with these 15 kids to get them graduated?

As part of the in-crisis declaration, the state worked with VHS on a comprehensive school improvement plan. The declaration also brought much-needed resources to VHS. The school received more funding to provide state test tutoring for students. The school changed its focus from a vocational high school to a high school that prepared students to pass state-sponsored academic tests and also provided vocational instruction. Many CTE teachers feared that the loss of hours in their program would prevent students from earning enough practicum hours to pass state boards or other certification exams that signaled to employers that the students were prepared to enter the workforce. The traditional mission of VHS was being threatened. All of these changes led one administrator to comment:

> *High school administrator:* Where I think we fall apart is that we're so eager to find a fix, we don't give many of these programs an opportunity to mature. . . . I think sooner or later, we're going to have to start to deal with the internal problems. . . . What is [the student's] motivation for being here? What does he expect to get out of it? And I have a very strong suspicion that the answers to those questions are very different for the system and for the kids. And until we get the two together, we're going to have a substantial portion of those youngsters that aren't going to stay on board.

Perhaps the most far-reaching change to occur at VHS was the implementation of an admissions policy. Future VHS cohorts would no longer be comprised mostly of students who did not want the academic challenge of the other high schools. For the 2002-03 school year, the new admissions policy required VHS applicants to have respectable records in the areas of attendance, discipline, and academic achievement. Students were to write a short essay describing why they wanted to attend VHS. Such qualifications precluded the future use of VHS as the district dumping ground. With the state at its side, VHS was able to choose a freshman class that, by all accounts, was much better behaved and ready to learn at grade level than any incoming class VHS had seen in years.

By coincidence, the freshman class of 2002-03 was our 7th grade cohort, so we could confirm the differences between this cohort and our 9th-grade cohort. There were some limitations in our ability to compare the groups. First and foremost, our 7th grade cohort consisted of all students who were in Grade 7 at one middle school in the district in 2000-01. There were five other middle schools in the district that could send students to VHS. In addition, not all of the students at this middle school attended VHS. Thus we can only examine those students from one middle school who chose VHS and became a part of its freshman class.

Despite these limitations, there were a number of axes along which we could compare the 7th- and 9th-grade cohorts. Demographically, there were significantly more White students, more free/reduced-price lunch program participants, and more Limited English Proficient students in the 7th-grade cohort than in the first-time 9th-grade cohort from two years earlier (see Table 79). In terms of prior achievement, the 7th-grade cohort students who chose to attend VHS had significantly higher math scores on the 8th grade state test than the freshman class of two years prior. Reading scores for the 8th grade state test were not available for the 7th-grade cohort.

Table 79
Demographic comparison of 7th-grade cohort and 9th-grade cohort, VHS site

	Vocational High School		
	7th-grade cohort (N = 96)	*9th-grade cohort (N = 352)*	
Demographics	*%*	*%*	
Gender			
Male	62	57	
Female	39	43	
Ethnicity			
Asian	0	1	
African American	22	23	
Latino	60	63	
White	18	10	*
Other	0	0	
Free/Reduced Lunch	89	69	*
Special Education	30	41	
Limited English Proficiency	23	5	*

		Attendance			*Attendance*		
School Attendance	N	N *Days*	*Rate*	N	N *Days*	*Rate*	
1st Year	96	153.70	85.4	352	143.78	79.9	*
2nd Year	92	146.24	81.2	344	127.30	70.7	*

Achievement	N	*Mean (SD)*	N	*Mean (SD)*	
Eighth-Grade Math	96	214.65 (7.24)	291	197.42 (38.28)	*
Eighth-Grade Reading	N/A	---- (----)	291	198.86 (67.50)	
Tenth-Grade Math	53	222.64 (9.80)	208	213.06 (8.05)	*
Tenth-Grade Reading	51	226.31 (11.99)	203	216.25 (10.11)	*

Note. Eighth-grade reading scores were not available. Due to a great deal of missing data for 10th-grade achievement for the 7th-grade cohort, results must be interpreted cautiously.
**p* < .05.

We were able to compare each cohort's attendance during their first two years at VHS. The 7th-grade cohort attended school significantly more days during their first two years at VHS than the 9th-grade cohort had (see Table 79). These differences mean an average increase of about 10 days for each student during the first year at VHS, and 19 days per student during their second year at VHS. The improvement in attendance was sustained and consistent. At VHS, both cohorts of students took the high stakes state test in their sophomore year, both of which fell during the years of this study. The 7th grade cohort's scores in both math and reading were significantly higher than the 9th-grade cohort's scores, although missing values for the 7th-grade cohort on both tests limit this comparison.

These findings are suggestive of the very different freshman classes to enter VHS in those two years, but not conclusive. Obviously, there were other forces at work, including a possible middle school influence. The state attention and resources provided to VHS as a result of the in-crisis declaration could have attracted a higher caliber student, and those resources could have produced students with better attendance. Nevertheless, these data do support the anecdotal reports that the incoming freshman class of 2002-03 was a more prepared group than prior years. As one administrator described the change:

> *High school administrator:* The admissions policy really screened out a lot of the non-performers, not the low performers, but the non-performers, from coming here. And it forced them into the other buildings. So what happened is the dumping of kids into this school was kind of stemmed a bit. . . . The non-performers have a really devastating effect on the school. Because they really don't want to learn, they don't come to school. When they do come to school, they're here for reasons other than education. They require a lot of disciplinary attention. They really fragment teachers' efforts to teach, because they're disruptive. And so rather than having huge numbers of that type of student in the building now, there's much less of that. I mean, it was almost the majority of the kids here who were not interested in learning.

Although certainly helpful, the admissions policy was not a panacea. As seen in Table 77 above, VHS continued to struggle with low state test scores, even after the first cohort admitted under the admissions policy had taken the exam (in 2004). However, that year did mark a high in both math and English test scores. This high, it must be noted, is still substantially lower than the state averages. The district scores are also quite low, lending credence to one administrator's observation that "this whole district is 'in crisis' in a lot of ways."

As this study came to a close, teachers were working on a school improvement plan that included a reinvigorated attempt at fully implementing HSTW. Many believed that the changes would be good for VHS, even students who might have preferred that VHS remain a haven for disengaged students:

> *Ninth-grade cohort student (as a senior):* That's what I came here for, to have fun.
>
> *Researcher:* And do you like the teachers as a whole?
>
> *S:* Most of them. Yeah.
>
> *R:* What about the principal?
>
> *S:* He's good for VHS and bad for students.

R: Why?

S: Because people who come here to have fun aren't going to have fun anymore. So it's good for VHS because it means you'll get it to the level as everybody else.

How Achievement Happens at VHS

Engagement

Attendance. As shown in Chapter 3, chronic absenteeism was a major problem at VHS. One VHS teacher opined that parents often enabled their children's poor attendance by signing off unexplained absences. This teacher noted that the use of parent excuse notes had become so widespread that the district had begun to charge parents a fee for writing more than four notes per marking period.

The average daily attendance at VHS during the early years of this study fluctuated between two-thirds and three-quarters of the student population. But, as one administrator put it, "It's not the same 25% [of] kids [absent] every day. Out of 100, it's moving around, so it's a real problem." Some classes we observed had a 50% attendance rate, and teachers spoke of students on their rolls whom they had not seen in months. With a random mix of students attending class any given day, teachers had to decide whether to repeat content for those who had been absent, or to move forward with those who attended more regularly. This daily choice wrought havoc on the curriculum, and did not encourage students to continue to show up.

One teacher tried to explain the high absentee rate, which began in 9th grade:

CTE teacher: It's a huge building, and [students] come from a very structured environment in middle school, which is small. That's why we were losing so many in 9th grade. Coming to Vocational High, some of them have to take two different transfers on buses to get here. So along the road, if they have to stop downtown, they stay downtown. Too much freedom. And then when it's time to get in this building, it's so huge, they'd wander off. If the kid isn't really interested in coming to school, there's a lot of different things to distract them real easily and say, "I'm going." A lot of doors in this building they could easily walk out of.

Low student attendance was evident not only in the official attendance rate, but also in anecdotal accounts of other school-based events. We heard about extremely low attendance rates for Tech Prep activities, the administration of the state test, and tutoring for the state test. We heard from many VHS stakeholders that low student attendance significantly contributed to the numbers of freshman students repeating 9th grade, and to low overall achievement at the school.

Dropout. According to a district administrator, at the time we began this study, the districtwide dropout rate had actually decreased from that of a decade earlier. At that time, the entire district had suffered as the city it served lost its manufacturing base, leaving most families living in poverty. Support programs, grants, and alternative schools were cited as reasons for the improvement in dropout rates, but VHS had continued to struggle. As noted, VHS had been the dumping ground for the district's middle school students who were ill-prepared to attend high school. In 1999-00, the year we began the study, special education students comprised 35% of the student population at VHS (see Chapter 2, Table 4), while the districtwide percentage was 22%. In that same year, VHS 9th graders performed below 7th grade level on the Iowa Tests of Basic Skills (ITBS), compared to a Grade 8.5 ITBS score for C-VHS students.[13]

A long-standing policy of social promotion in the K-8 system also contributed to the inability of VHS to improve dropout rates—as students entered high school and could not perform, many became discouraged and dropped out. We also heard anecdotally that a large number of female students became pregnant during high school, dropped out to deliver the child, and did not return to school.

Learning Math and Science at VHS

The majority of students entering VHS were not ready for high school math. One CTE teacher said, "If you ask them to find 5% sales tax, they're really not able to do it." An academic teacher noted that students needed a calculator for the simplest problems: "So any time you have a fraction in a problem, forget it. You have to go back to basics every time you turn around."

Many VHS stakeholders agreed on the main reasons for students' poor academic performance: past social promotion, chronic absenteeism, and low levels of literacy. Teachers and administrators alike pointed out that much of mathematics, especially on the state test, involved reading comprehension. Because many students were reading below grade level, one academic teacher said, "By the time they read the question, they're lost sufficiently where they feel they cannot answer it."

There were not enough classroom time interval sheets or observation forms collected in math or science at VHS to produce conclusive results in terms of student attention rates or pedagogical practices. It was therefore also not possible to determine whether student attention approached the 78-93% range that has been associated with student achievement gains and effective use of class time (Brophy, 1988; Stallings, 1980).

Learning in the CTE Classroom

The CTE classroom observation data suggest that the CTE classes did not reach an overall mean student attention rate in the 78-93% range (see Table 80): the student attention rate for CTE classes only reached about 75%.

While there were not sufficient math or science classroom time interval data to analyze those subjects, all academic classes could be combined and compared to CTE classes. Table 80 shows that students were not significantly more engaged in CTE classes than in academic class-

13 Freshmen at the other two high schools in the city scored at the 9th grade level, only slightly below the national ITBS norm of Grade 9.8.

Table 80
Student attention rates, VHS, CTE classes and academic classes

	CTE Classes			*Academic Classes*		
Student Attention	N Observations	N Intervals	*Mean (SD)*	N Observations	N Intervals	*Mean (SD)*
Overall mean	6	53	75.88 (16.77)	7	49	62.53 (13.53)

es. Given that this is a vocational high school that students knowingly chose, it is somewhat surprising to find such low attention rates during the CTE classes. The entire results are presented in Appendix C.

The directed question form and our interviews with students may help explain the low student engagement at VHS. For instance, the directed question form elicited information on elements of CTE classes that might generally be considered engaging aspects of CTE programs as compared to academic classes. Some of these include the ability of students in these classes to manage their time and materials and to make decisions independent of the teacher, multiple instructional strategies beyond "book learning," and the overall focus of CTE—preparing young people for their life beyond school.

We observed eight CTE classes, some of which lasted most of the school day. We found that career preparation and multiple instructional strategies were indeed prevalent across these classes. Decision-making and time management were also present in most of these CTE observations, which was not the case in the academic class observations (table not shown). However, we did not see many CTE classes (or any academic classes) creating products with value outside of the classroom, a practice that adds authenticity to schoolwork and can counter student apathy (Stern et al., 1994). We heard about integrated projects that had taken place in previous years, where students designed or created products for purposes outside of the school (see below), but we did not witness any such activities in our observations.

The VHS site was in disrepair. For example, the marketing program ran the student store, which was located in a classroom. The observer noted that she had not seen such a vintage cash register in decades. The electrical wiring in the VHS buildings was archaic and not capable of handling the load of computer networking, limiting what the computer technology program could accomplish. The worst example, however, was the nursing program. One observer described a large room divided into several classrooms by office cubicle partitions—hardly soundproof enough to run classes simultaneously. It was easy to disrupt many classes at once in such an environment. The adjacent lab area also seemed insufficient for a learning environment, as described by the observer:

> The teacher and students had to share the same "sterile" pack containing the actual catheter and pretend that they were maintaining a sterile field. There was only one dummy, so each student stood and watched while every other student did it, one at a time. The hospital beds

> and sheets looked like vintage 1950s hospital equipment. One of the students, as she began to do the catheter exercise, said, “Ms. W., wouldn’t it be neat if we had one of those curtains around the bed, so we could close it for these kinds of procedures?” It was kind of sad.

Academic classroom resources were equally poor. Observers described classes with actively leaking ceilings, poor ventilation, and no lab stations in science classrooms. Of course students were aware of the dismal facilities at VHS. Some students questioned why their school continued to operate in such a state of disrepair: “Look at this room, what do you see? You see messed up walls. They could afford new chalkboards. We can afford all this stuff, but they don’t pay for it. They use the money for the sports teams.” Another student did not hold out hope for the rehabilitation or replacement of the VHS facilities: “If they’ve been talking about it for this long, it’s obviously not going to get done.” As one teacher put it,

> *Academic teacher:* The kids walk into this building and say, “They don’t care about us. Look at what we have.” . . . The building needs a coat of paint. It needs some electrical outlets, a couple of little things. Make us feel nice about being here.

Previous research has indicated that the state of a school’s physical plant can be a source of attitude, discipline, and performance problems, because the long-term neglect of a facility sends the message that what takes place there is not important (National Association of Secondary School Principals, 1996).

The findings from interview and observation data do not converge upon an explanation for the low levels of student engagement at VHS different from the overall assessment of VHS students shared by school and district administrators: low expectations, low motivation, and low achievement.

There were other elements of the CTE classroom observations that were cause for concern. For example, we did not see any instances where the local labor market was the focus of class discussion or activities—there was no attention given or mention made of the ways in which the skills being taught were used in workplaces in the area. Additionally, none of the CTE classroom observations reported students doing any math, a subject with applications in most if not all CTE programs. While we heard about instances of both of these elements of successful CTE, we did not see them ourselves throughout our four years of data collection.

Integrating Math or Science with CTE

As we were selecting sites for this study, we heard about strong instances of curriculum integration at VHS. The carpentry class had worked with a math teacher on a regional contest to build a trebuchet, a medieval slingshot of sorts that was developed after the catapult but before mechanized weaponry. Contestants were to build a working version, and the team whose trebuchet could hit a target with a water balloon would win. The purpose of the contest was to have teachers work across the curriculum. As the carpentry students began to design their trebuchet, they realized that they needed metal parts, so they invited the machining and drafting programs to participate. The math teacher became involved at key times in the planning and building:

> *Academic teacher:* The students were building a basket. We had decided that it had to be a hinged basket suspended from one end of an arm, so it's weight driven. So they came up with a wedge-shaped piece of a circle. But every kid who looked at the plan said, "Well that's not going to be big enough." Golden opportunity for me to say, "Well why not? How much is it going to hold?" So the math part came in there. How big a piece of a circle is this? What volume will this hold? Well, we had already decided to use a thousand pounds of sand. So everybody had to go out and get a bag of sand, make a one-foot cube to see how much a one-foot cube would hold.
>
> *Researcher:* So how much weight did they use in the end?
>
> *T:* It was about 850 pounds that we needed in order to accurately fling the 16-pound weight 225 feet.

As word spread about the project within VHS, other academic teachers joined the team, and incorporated the historical and scientific aspects of the trebuchet. On the day of the firing contest, the VHS students were in charge of their trebuchet, unlike the teams from other schools, where the teachers fired the weapon. On the first try, the VHS water balloon came up short. The students made some adjustments, and fired again.

> *Researcher:* Did they calculate their adjustments?
>
> *Academic teacher:* They eyeballed it an awful lot. They did a lot of calculations before the fact. They did a lot of figuring out. Most of our students don't do fancy schmancy math. They just don't get that far. They eyeball it. They do basic calculations. But that seems to work.

The students from VHS were able to hit the target on the next shot. No other team succeeded in hitting the target.

Other integrated projects also captured the imagination of CTE and academic teachers alike. For instance, VHS students were asked to build an arched entryway for the local museum's exhibit of Tibetan art. In order to make a mandala and the other designs for the structure, students needed history, math, and other subjects to help them understand the context for the designs they were building. English teachers assigned writing assignments based on such projects.

While some of the best examples of curriculum integration at VHS involved large projects and some partnering or impetus from outside of the school, vocational and academic teachers also worked together to integrate curriculum in other ways. As noted above, the Prep School (the 9th-grade program to get incoming students up to grade level) had CTE and academic teachers teaming to provide contextualized academics. One of the most successful integrated units in the Prep School involved teaching students about area and perimeter. Students were having trouble with the concepts, so the teacher had them go home and measure the square footage of their bedrooms, telling them that if they were ever going to paint their rooms, they would need that information to know how much paint to buy. Students came back with room dimensions and they drew their rooms to scale. The English teacher had them write about their room, describing it in mathematical terms (i.e., area, perimeter). Students then exchanged papers and had to draw the other student's room based on their description. Finally, students wrote a comparison-contrast paper using their own drawing of their room and the drawing of their room by their partner. Students became very engaged in this assignment, even bringing in paint chips and drapery swatches that they would use to redecorate their rooms.

Other than the Prep School, however, there were no formal arrangements for CTE and academic teachers to work together. While there were isolated instances of integration, it was for the most part absent. CTE teachers reported teaching basic math as it came up in class, and a few expressed reservations about academic teachers: "I honestly don't know what they're doing up in academics for math." Students also reported that CTE and academic teachers did not work together, but that their CTE teachers incorporated math, science, and writing when necessary.

Tech Prep

High school Tech Prep students in this consortium participated in a "pipeline" of preparatory activities as part of their Tech Prep experience (see Chapter 3). Sophomores toured their local community college campus. Juniors took a practice version of the college's placement test. Many students who considered themselves good students often found themselves placing in remedial academic courses after this test. These students were given what one administrator called a "scared straight" talk, in which they were shown that if they did not have basic math skills, it did not matter if they were currently in Algebra 2, they would not pass the placement exam. They were implored to use their remaining time in high school to learn these subjects so as not to waste time and money on remediation later on. Students saw that they would not be admitted to the career program they wanted if they could not read or do math at a college level.

Seniors shadowed a community college student enrolled in the program that they were considering. This way of defining Tech Prep participation caused some difficulty at the high schools, especially VHS, which, as we noted above, had low attendance at any school-sanctioned activities. Although data were not available for the pipeline of the class of 2002, the class of 2004 reflected a typical pattern. Of the 46 VHS seniors in 2004 who had been registered into the Tech Prep pipeline when they were sophomores, 44 of them had not participated in any activities. A VCC administrator described how Tech Prep activities often went with VHS:

> *Community college administrator:* They [VHS] might have signed up 15 kids for something, that's great. I mean they've got 46 kids in Tech Prep and 15 of them are all they were able to get signed up for the fieldtrip. Comes the day of the event, and we've got five tour guides. We've got somebody doing the test. We've got pizza for 15 kids coming in. And they put 7 kids on the bus. [We have to] cancel the fieldtrip. And reschedule it and figure out what they need to do to get more kids on the bus. This has been an ongoing problem.

In defense of VHS, the school changed Tech Prep coordinators three times during the tenure of our study. During the time that the class of 2002 would have been recruited into Tech Prep, the coordinator was a classroom teacher who did not have the time to do the "legwork" necessary to get students into the pipeline. Once the coordinator position changed hands to an administrator with no classroom duties, the Tech Prep pipeline became wider, although student participation in the activities remained a challenge. In our interviews with VHS students, few had heard of Tech Prep and none with whom we spoke were participants in the pipeline.

Postsecondary Transition at VHS

VCC was the local community college. Like many of the city's older institutions, the VCC campus was housed in historic buildings. While steeped in grandeur, the facilities showed their age, and much of the technical equipment inside them needed upgrading as well. VCC seemed a natural next step for VHS students, because it was located near VHS and offered over 40 technical and occupational programs leading to certificates, degrees, or transfer opportunities. But many department heads we spoke with, including at the School of Nursing and in the Automotive Technology program, reported that few VHS students applied, and those who did tended not to meet the qualifications for these programs. We spoke to other department chairs in program areas aligned with the CTE programs at VHS, many of whom claimed that it had been a few years since VHS students had applied, and they attributed this to a lack of preparation and motivation on the part of VHS students.

Remediation

As seen in Chapter 3, the need for remediation among VHS graduates was quite high. This can be attributed to their low levels of academic achievement during high school. According to VCC administrators and instructors, remediation rates were high for most students, not just VHS graduates. Like many community colleges, VCC did not grant college credit or allow students entry into certificate and transfer programs until they finished their remedial work. One remedial instructor reported that some students faced several levels of remedial mathematics, and often a remedial English course as well, before they could take college-level academic courses. In some cases, those college-level courses were themselves pre-requisites to the certificate and transfer programs. College administrators were working to lessen these barriers by offering remedial courses geared toward exploration of several career areas such as health, business, and engineering. They hoped to increase student interest and persistence in the remedial requirements by integrating career-related content into these courses.

VHS Summary

The outcomes for the cohort under study at VHS were not positive. C-VHS equaled or outperformed the VHS students on every measure except CTE credits earned, which might have been expected in this comparison between a vocational and a college preparatory high school. But given the fact that VHS had served for years as the repository for underperforming and nonperforming students, the number of measures that showed equal outcomes between the schools was striking. VHS and C-VHS students had similar numbers of students graduating on time, creating post-high school plans, needing remediation at VCC, and earning similar numbers of credits at VCC.

VHS had seemed on the cusp of improving student achievement when we began the study. Many strides had been made to improve the environment for learning. Programs were in place, some described above, to lift students up to grade level. The HSTW reform effort had begun. But it must be noted that HSTW is a relatively weak intervention in that there is no mandated curriculum, specific instructional techniques, or ongoing professional development (Borman et al., 2003). In the absence of such mandates, the teachers and leaders at VHS did not have the heft behind them that was needed to overcome the dysfunctional assumptions, procedures, and relationships that had been in place for decades. The school continued to be a refuge for disengaged students. The reform efforts failed, and academic achievement did not improve. In fact, as noted above, VHS was declared a school in crisis by the state as a result of poor academic performance.

None of these are reasons to invalidate VHS as an important site to study. The issues that affected VHS were intractable ones that schools across the nation are dealing with. Students enter high school without the academic background to do the work. High schools cannot fix nine years of previous schooling's shortcomings in four years. The ways in which VHS succeeded and failed at its particular mission are very interesting and timely in this current context of academic accountability. Thus while the case of VHS does less to answer our original research questions, it does aptly describe the struggles that some traditional vocational schools now face in this era of academic accountability. Such schools were viable in the past, but now they must graduate students with the same level of academic skills as their college preparatory counterparts.

State intervention appeared to be providing some hope for VHS. As this study came to an end, newer cohorts with stronger academic backgrounds were arriving. In addition, the in-crisis declaration may have spurred formerly disinterested teachers to investigate reform as an avenue to improve achievement at VHS.

CHAPTER 5
CONCLUSIONS AND RECOMMENDATIONS

There are myriad reasons why young people may not excel in high school. No study can identify and test all of the issues that keep students from attending school, learning the subject matter, and graduating with a post-high school plan. However, in this study we identified several important barriers to these accomplishments among poor and minority students. We looked to the literature for ideas for how to overcome these barriers. We constructed a conceptual model that showed the role of these structural, programmatic, or organizational elements in student outcomes. Then we sought high schools that were implementing some of these elements as part of a coherent reform design, whether homegrown or adopted. We identified student cohorts whom we monitored over four years. We found comparison schools in the same or nearby areas that were not implementing such reform, and compared outcomes. This chapter reviews the major findings of the study and puts forth some recommendations for policy based on them.

The results of this study were complex, and some ran counter to our expectations outlined in the model in Chapter 1. Large-scale studies tend to find weak effects overall precisely because they aggregate the individual results. Table 67 (see page 85) summarizes the study results, which are student-level outcomes in the areas of engagement and achievement in high school, and transition to postsecondary education. It shows that consistent improvement across subject areas is difficult to achieve. None of the three study high schools (AHS, PHS, or VHS) achieved consistent gains over their comparison groups across all such measures. However, each school did achieve some success compared to its comparison school; these successes were detailed in the preceding chapters. To the extent possible, contextual and idiosyncratic factors were also presented as possible explanations for or supplements to the findings.

Despite the mixed results, one finding held true across all six high schools studied: the odds of dropping out declined as the proportion of the high school experience invested in CTE courses increased (see Tables 7, 27, and 48). Independent of the school effect, we examined a CTE coursework effect, and found this to be a significant negative predictor of dropout regardless of high school attended.

Studies using national datasets have found the same CTE effect, and have suggested that this effect is curvilinear (Plank, 2002; Plank, DeLuca, & Estacion, 2005). In Plank et al.'s analysis, the point of inflection is approximately 0.46, or roughly one CTE credit for every two core academic credits. Put another way, in a high school where students typically earn 24 Carnegie units over four years, the ideal ratio would be 13 core academic credits, 6.5 CTE credits, and 4.5 other credits (including foreign language, fine arts, or physical education). As a point of comparison, Levesque (2003) reported that in 2000, high school students earned an average of almost 26 credits, including nearly 19 in core academics, 4.2 in CTE, and 2.9 other. The credit distribution has in fact been tending towards more academic courses over the past 20 years (Levesque, 2003), rather than toward a more balanced ratio such as that described above.

Another important student-level finding across sites was that many students aligned their post-high school plans to their high school course of study. In the six measures of alignment (three study sites, two opportunities for alignment at each, see Table 67), the percentage of students who remained in their high school course of study after transitioning to postsecondary education ranged from 41% to 62%. This supports the purpose of many career-based reforms, which is to provide students with opportunities to explore career or industry areas early on, without sacrificing the opportunity to attend college or pursue other options. The career-based courses of study also provided greater coherence to these students' high school experiences. This coherence in school can help students feel some control over at least one aspect of the turbulent period of life called adolescence. The courses of study allowed novice students to develop competence in an area of interest to them in a relatively safe environment. The students in this study benefited from thinking seriously and making some decisions about their future while still in high school. Student interviews confirmed this, regardless of whether they felt they would choose the same course of study if given the choice again.

At AHS, the site with the most strongly linked middle school in terms of the high school reforms, we found a middle school effect. Because we were able to construct a comparison sample of students who had attended Academy Middle School (AMS) and then C-AHS, we could test for a middle school effect on high school outcomes. The results showed that while AHS students outperformed the other subgroups from C-AHS (see Appendix D) on measures of attendance, dropout risk, and the odds of graduating on time, there were no significant differences between AMS students who attended AHS and AMS students who attended C-AHS. We concluded that the rigorous middle school experience students received at AMS—including a strong academic base, good study habits, articulation of personal expectations, and general buy-in to school—helped students through high school, regardless of which high school they attended. This effect could not be tested at the other two sites because we were unable to construct similar subgroups in the other districts.

Looking at the results of the community college analyses, we found that regardless of the level of high school academic press, the majority of students who attended their local community college needed to take remedial coursework. Only PHS graduates who attended PCC outperformed their comparison group counterparts on remediation rates. However, 60% of PHS graduates attending PCC still needed remediation.

Overall, academic achievement results were disappointing. There were few consistent results to report from any of the comparisons, either in high school or at the community college. The news, then, is that although career-based comprehensive school reform may not have increased student achievement, neither did it decrease it. The ultimate effect of career-based comprehensive school reform was rather neutral. Beyond achievement, other lessons were learned and implications derived from this study; these are outlined below.

High Schools and Reform

Implementing high school reform is an extremely difficult task. As with any organization, schools operate the way they do because of long-held assumptions, procedures, and relationships. Reforms require changes to many of these, such as the school's assumptions about its parents, procedures with its labor unions, and relationships with other schools in the district. Such changes can lead to stakeholder clashes. School reform is not a neat process, and some interests get advanced while others are curtailed.

This was perhaps most evident at VHS, where, despite several attempts, this struggle does not seem to have fully played itself out yet. Factions of teachers were not part of the process that brought High Schools That Work (HSTW) to VHS and such factions actively opposed the reform. While this was not the only reason that these reforms did not take hold, it is clear that teachers play a pivotal role in the success or failure of high school reform.

Implications for Policy

Our findings have implications for several areas of state and federal policy, ranging from middle school to community college. First, at AHS, the site with the middle school that was most closely linked to the reform at the high school, we found a middle school effect that continued into high school, regardless of high school attended. The potential positive impact of a strong middle school experience is clear. Middle schools need to provide the academic foundation for high school success. Such an investment is likely to pay off in better high school student performance.

With respect to high school reform implementation, teachers are the nexus between the reform and the students. Therefore while seemingly obvious, it bears repeating: Involving all faculty, hearing all sides, and emerging from the process with a coherent direction are key steps of successful reform. Teachers who may not agree with the ultimate direction of reform are less likely to sabotage it if they feel that their voices and concerns have been heard. There are many barriers to high school reform. Working to optimize faculty support, while time-consuming and potentially contentious, is worth the effort.

Third, there are implications of the one consistent finding in this study: CTE coursework was negatively associated with dropout (see Tables 7, 27, and 48). Coupled with Plank and colleagues' findings (2002, 2005), we posit that perhaps we ought to further explore the motivational power and the holding power of non-academic courses such as CTE and other electives that allow maturing adolescents to develop facets of themselves other than academic skills.

Fourth, we believe that we witnessed the purpose of the school accountability movement being played out at the VHS site. This movement to hold all schools accountable to a single, high standard of academic achievement identified a school that was indeed in a state of crisis and neglect. The push for accountability saved VHS from remaining a failing school by intervening and providing resources (e.g., technical assistance, grants for student tutoring) that the district could not or would not provide. Although many schools fear "state takeover" and teachers argue that states cannot possibly teach students better than teachers can, states can bring resources to bear on many conditions that prevent a school from improving its students' academic achievement. All of the teachers and staff we spoke with at VHS felt some sense of hope or relief after the in-crisis declaration. Many felt as though a spotlight had finally been placed on an untenable situation, and with that attention and assistance would come a more effective high school. Their only concern, and this came from both academic and CTE teachers, was that the vocational mission of schools like VHS not be abandoned in the quest for higher academic achievement. We echo this concern, and applaud current state efforts to develop rigorous academic and CTE standards for all students.

Finally, we believe that the need for remediation among high school graduates needs to be addressed. After all, these are students who have fulfilled all of the graduation requirements for their high schools, including, in some cases, high-stakes tests of academic skills. Students who graduate from high school need to be fully prepared for the next educational step so that they can avoid remedial coursework. Remedial courses do not grant college credit, and students who must take classes at college for one year before earning any credits or being allowed into occupational programs are students who will likely drop out before receiving a postsecondary certificate or degree. One possible approach might be state-by-state commissions organized to examine high school content standards and postsecondary placement exams in order to determine the gaps between them and how to fill them in high school. We also suggest that colleges experiment with ways to keep remedial students engaged and progressing to college-level programs. The pilot program at VCC (see Chapter 4), for instance, that integrated occupational program content into remedial courses, is one way promising way to do this.

Conclusion

The experiences at all of the study high schools show the iterative nature of reform. Conditions do not remain static. Whether it is personnel changes, changes in student populations, or policy changes that shift priorities, change is the only constant in school reform. Perhaps the largest change since we began the study in 2000 has been at the state and federal levels, where accountability has achieved unprecedented prominence. Looking back from this vantage point, and seeing the current progress of the states in developing standards systems for CTE, it seems that we were ahead of our time, thinking that we would see improvement in student achievement at high schools with career-based reforms. We began the study at a time when there was not the same level of attention to the mission and potential of CTE. What we saw instead over the course of the study was the turmoil that takes place during a change period, as academic standards were being mandated at all three schools but CTE program areas had not yet had a chance to respond. Academic standards placed much pressure on CTE, and we witnessed the throes of change as schools tried to respond to higher expectations brought about by *No Child Left Behind*, a law that was not even being considered when we began this study.

Therefore, the conclusion we draw from this study is that we found rather neutral effects of career-based comprehensive reform efforts on the engagement, achievement, and transition of students from minority or high-poverty backgrounds. But given the dramatic changes that have taken place since this study began, we believe that similar studies in the future could yield more fruitful results.

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APPENDIX A
METHODS SUPPLEMENT

This appendix provides more detail on the qualitative and descriptive methods employed in this study. In order to measure student engagement, achievement, and transition in the context of CTE-based comprehensive school reform, we needed to determine that the study schools were indeed implementing such reforms. While many aspects of reform are easily discernible (such as the division of a school into career academies), it takes classroom observation to determine if the reforms are having an impact on curriculum and pedagogy, which is how student engagement and achievement improve.

Qualitative Data Collection

To create case studies of the study high schools at the three longitudinal sites, the research team made annual visits to each site over a four-year period, beginning with the 2000-01 school year and ending with the 2003-04 school year. To the extent possible, we scheduled the site visits for the same time each year for each site. Each visit was designed to follow our three cohorts. Thus, the first two years included visits and data collection at the middle schools in order to follow the 7th grade cohort. The last two years included visits to the community colleges in order to collect data on the 11th grade cohort. All four years included time spent at the high schools. A team of four or five researchers spent approximately four days at each study site each year, visiting the various schools at each site.

Due to resource limitations, we did not generate full case studies at the study schools' comparison high schools. However, we visited each of these three schools at least once during the study. We toured the campus, spoke with teachers and administrators, and, in one instance, interviewed math and science teachers during those visits.

Interviews

We conducted individual interviews and focus group interviews (Krueger, 1994) with stakeholders (students, teachers, and administrators) at all of the study schools. We used semi-structured interview protocols and updated them for stakeholders who were interviewed more than once.

When possible, the same questions were asked of each group of stakeholders for purposes of data triangulation. Examples of these include questions about overall school climate, and questions about the kinds of opportunities available to students as a result of postsecondary and business partnerships. But some questions were only posed to specific groups of stakeholders. For instance, teachers and administrators were asked about the curricular and structural changes that had occurred as a result of the reforms. They were asked to comment on the influence of state or federal directives on their reform efforts. Teachers, especially new teachers, were asked to describe how the reforms were visible in their classrooms. They described the extent of their collaboration with other teachers, assessed the level of parent involvement, and addressed other reform-specific practices. Teachers and students described the types of assessments used in their classes, for both academic and CTE courses. Students were asked how they would choose or had chosen their academy or pathway in high school, about their career plans, and whether they thought their friends would graduate from high school. Students who were interviewed multiple times responded differently to these questions over the years, yielding histories of career exploration by these youth. Finally, administrators were selected to be interviewed based on their role in the implementation of the various reforms. They were asked to describe their duties around the reform, which often evolved over the course of the study.

The selection process for teacher interviews was both purposive and incidental. At the beginning of the study, the first teachers we interviewed held some leadership role (reform team leader, academy leader) or had been nominated by the principal. Some of these teachers were interviewed in later years as well. Data collected from each year's site visit determined who would be interviewed in subsequent years. For example, a high school math teacher praised the efforts of a middle school Algebra teacher, prompting a classroom observation and an interview with that teacher the following year. Some teachers were selected based on the subjects they taught, in order to speak with a representative range of teachers. In the latter years, some veteran teachers were chosen from the master schedule precisely because they had never been mentioned in previous interviews. Over the course of the study, we interviewed a total of 118 teachers at ten different schools. As can be seen from Table A1, most were high school teachers. This makes sense as high school was the focus of this study and we spent the most time at the high schools. We interviewed a roughly equal number of CTE and academic teachers at each high school site.

We selected student interviewees from students who were in the 7th, first-time 9th, and 11th grades in the 2000-01 school year. Students were eligible if they had scored between the 35th and 49th percentiles in reading and math on the most recent state standardized tests. We sought mid-level students because previous research suggests that low to mid-level prior academic achievement is associated with participation in CTE (Silverberg et al., 2004), and we were concerned that lower academic achievers might drop out before the end of the study.

There were two groups of interviewed students: shadowed students and focus group students. We selected one student from each grade cohort at each site to "shadow," or observe for one entire day per site visit. These nine students were also interviewed each year. Previous studies (e.g., Stringfield et al., 1997) have found such shadowing to provide unique and useful information on students' experiences and perceptions as they progress through schools undergoing reform. We chose one 7th grade male Latino student with limited English proficiency at each middle school. At each high school, we selected an African American female in the 9th grade, and an 11th grade student of any gender or ethnicity who was in a nontraditional CTE program. We were generally successful shadowing the original students we selected over most of the four years. However, we lost some students and did not replace them all. In total, we shadowed 11 students.

The focus group students were usually interviewed in groups of three to six, but some were interviewed individually. Again, we selected from students who were in the 7th, first-time

Table A1
Interviews conducted at the study sites

Interviews	*AHS*	*PHS*	*VHS*
High school			
Administrators	4	10	13
Teachers – CTE	9	12	19
Teachers – academic	8	14	25
Students	19	26	22
Shadowed students	5	3	2
Middle school			
Administrators	1	4	3
Teachers – CTE	0	4	2
Teachers – academic	5	5	2
Students	10	10	9
District personnel	0	5	5
External contacts	5	6	0
State department of education	0	7	7
Community college			
Administrators	0	13	11
Teachers – CTE	3	7	0
Teachers – academic	0	0	1
Students	8	15	2
Regional skills center			
Administrators	n/a	2	n/a
Teachers	n/a	2	n/a
Totals	77	145	123

Note. Students at the skills center were interviewed, but were counted in the PHS high school count. External contacts include reform design personnel, business partners, and former administrators.

9th, and 11th grades in the 2000-01 school year, and who had scored between the 35th and 49th percentiles in reading and math on their state's standardized tests. For the focus group interviews, we enlisted the school's help in finding equal numbers of male and female students who represented the ethnic composition of the school. We attempted to interview the same students each year, not always successfully. Over the course of the study, we interviewed a total of 120 focus group students, distributed fairly evenly between the middle schools and the high schools, respectively, but less so in the community colleges (see Table A1).

We interviewed 61 administrators from the middle schools, high schools, and community colleges. Finally, we interviewed 35 others who were related in some way to the reform efforts taking place at these schools, including district and state administrators, reform design partners, and business partners. In total, then, we conducted 296 interviews and interviewed 345 people.

Many of these stakeholders were interviewed more than once over the course of the study, and many people were interviewed in pairs or groups, so that the number of interviews conducted does not equal the number of people interviewed.

Table A1 shows that we interviewed fewer stakeholders overall at the AHS site than at the other sites. AHS was on a two-hour block schedule, which made scheduling interviews more difficult than at the other sites. We often did not need two hours with an interviewee, but we could rarely schedule two one-hour interviews in the time block for logistical reasons. Other gaps in the AHS interview dataset include district and state personnel. AHS is a high school in a very large urban district. All our attempts to schedule interviews with district personnel failed. At our other sites, the district and state personnel were familiar with the schools participating in this study—indeed, as noted elsewhere in this report, some state personnel nominated sites to us. This was not the case at AHS. In this large state, we did not visit the distant department of education.

Classroom Observations

During the four years of site visits, the research team observed classes at the middle schools, the high schools, and the regional skills center. These classroom observations ranged from 50-120 minutes, depending on the duration of class periods at that site. The observation forms described here were tailored to the duration of the class period and the types of reforms being implemented at each school.

We employed a three-part observation protocol: a time interval sheet, a directed question form, and running notes. The entire protocol thus spanned the range from low-inference to ethnographic observations (cf. Castellano & Datnow, 2004; Datnow, Borman, Stringfield, Rachuba, & Castellano, 2003). Research team members were to provide evidence of reform design implementation and measures of student attention, as well as to richly detail the climate of the class and the work that teachers and students were doing. Research team members were expected to complete the time interval sheet and the running notes in real time. Following the observation, team members wrote their answers to the directed questions on the observation form. Similar combinations of data gathering instruments have been used successfully in previous studies of school effectiveness and reform design implementation (Castellano & Datnow, 2004; Datnow et al., 2003; Stringfield et al., 1997; Teddlie & Stringfield, 1993).

The first instrument, which we called the time interval sheet, was a modified version of the Classroom Observation Measure (COM), developed and validated at the University of Memphis (Ross et al., 1994). It comprises three sections, two of which required systematic, "snapshot" observations of the entire class every 6-14 minutes (depending on the duration of the class period), yielding low-inference data points on student attention and classroom orientation (i.e., teacher-led, project-based, etc.). At the end of the class, observers completed the third, more global section of the sheet, which gauged the extent of various classroom activities, including the use of computers. The purpose of the time interval sheet was to reduce certain classroom events to variables that could then be compared across classes.

See Figure A1, page 170 for an example of a time interval sheet. At the top of the sheet, research team members entered general information about the classroom observation. Based on the instructions and the actual time of day of the observation, we entered the times that corresponded to each interval segment. For instance, the sample in Figure A1 instructs the researcher to record observations in eight-minute intervals. Given that the sheet provides for nine data points, this sample sheet was for a class that was approximately 72 minutes in duration. We began the observations one minute after the bell rang in order to capture whether teachers were using all of the class time, or whether late starts and early wrap-ups were common. Every eight minutes, we made a global observation of the class and filled out the appropriate column for that time interval on sections A and B of the sheet. In Section A, we chose from among the classroom orientations on the form, circling the number that corresponded to the specific time interval.

Section B on student attention was filled out in the same way, choosing the approximate percentage of students who were on task. Student attention has been found to be related to student achievement gains (e.g., Brophy & Good, 1986). Stallings (1980) and Brophy (1988) both noted that student engagement need not approach 100% on-task use of classroom time. They found that an 80% or moderately higher engaged-time rate was consistently associated with higher achievement gains, and a rate lower than 80% was associated with lower mean achievement gains. Based on that work and other prior research (Castellano & Datnow, 2004; Datnow & Yonezawa, 2004; Ross et al., 1994; Stringfield, Datnow, Borman, & Rachuba, 1999), we assumed that a class average rating of greater than 78% but less than 93% could be described as an effective use of class time.

Section C of the time interval sheet was used to record the extent to which various pedagogical practices (e.g., sustained writing, alternative assessments, use of computers) were used during the class, where 0 = no use, 1 = some use, and 2 = extensive use. Means were calculated for the use of each practice in various subject areas. Many of these practices have been shown in prior research to be effective teaching strategies, as detailed below. Their presence on both the time interval sheet and the directed question form was an additional validity check for the classroom observations.

The second instrument, the directed question form, was used to gather rich descriptions of the classrooms we observed. This form required trained observer assessments of the presence or absence of various reform elements and classroom practices. Examples include evidence of curriculum integration, and how and to what degree students used math or writing in the class. The directed questions asked research team members to provide evidence and detail for their answers (see Figure A2, page 173). The sources for the directed questions were primarily research on CTE classroom practices (reviewed in Castellano et al., 2003), and more general research on effective teaching and learning (Newmann & Wehlage, 1995; Tharp, 1997).

From the research on innovative CTE practices, we developed questions about the presence of elements associated with the specific CTE reforms the schools were undertaking. Since each high school had adopted a different set of reforms, each high school also had a slightly different set of directed questions in the section on reform implementation. The "merged" form in Figure A2 includes the specific sections for each school. The directed question form included a section on what is known as the SCANS skills (Secretary's Commission on Achieving Necessary Skills [SCANS], 1991), skills that were identified as necessary for success in the workplace. We asked research team members to note whether or not these skills, which include basic academic skills, computer literacy, and "soft skills" such as teamwork, were attended to in the observed class.

The sections of the form that elicited responses on effective teaching and learning were based on similar forms from previous studies (Castellano & Datnow, 2004; Datnow & Yonezawa, 2004), modified for this study. The form used in this study incorporated Tharp's (1997) principles for effective classroom instruction:

(1) facilitating learning through joint productive activity between teachers and students;

(2) developing competence in the language and literacy of instruction throughout all instructional activities;

(3) contextualizing teaching and curriculum in the experiences and skills of home and community;

(4) challenging students toward cognitive complexity; and

(5) engaging students through dialogue.

The directed question form also included Newmann and Wehlage's (1995) tenets for successful school restructuring: involving students in higher order thinking and substantive conversational exchange, producing complex understandings, and helping students connect substantive, academic knowledge with current events, personal experience, or background. Not surprisingly, some of the elements in these two bodies of research overlap.

The goal of the directed questions—and the classroom observations in general—was to describe the practices that were evident in the classroom when comprehensive school reform and CTE reform merge at the high school level. The unique aspect of the way that we utilized the time interval sheets and the directed questions was that we elicited trained researcher judgments on the presence and extent of *both* academic and CTE skills and activities *in both academic and CTE classes*. In other words, we used the same instruments for both types of classes, because we were after the extent of curricular integration that went on in the schools where these reforms had presumably been blended. For example, we asked team members to describe the writing that went on in CTE classes, as well as whether, say, math teachers talked to their students about how a particular mathematics concept could be applied to real-life contexts.

Some of the directed questions on the form supplemented the rougher measures of the time interval sheet. For example, we could tell from the time interval sheet how often computers were used during the class, but we could not describe that use. However, questions on the directed question form elicited detail on the number of computers in the class and how they were used. We were then able to distinguish between computer uses such as conducting Web-based research, keying in final drafts of reports, or listening to downloaded music on headphones after completing a class assignment.

The third and final data collection device we used in the classroom observations was running notes of classroom activities, describing the actions of teachers and students. These running notes, taken in real time, were typed and submitted after each site visit. In addition, the running notes provided the basic information and the rich detail that team members needed to answer the directed questions following the observation.

The research team conducted a total of 185 classroom observations across all schools, for a total of 248 hours. The selection process began as the teacher interviews had begun: classes were recommended by school leaders or were taught by school leaders. If, during our initial site visit, we heard of classes in which teachers were integrating academic and vocational instruction, or classes in which other reform-based practices were known to be used, we scheduled an observation of that class. We tried to observe a class from each teacher we interviewed, to the extent possible. We tried to observe approximately the same number of CTE and academic courses. Table A2 provides a breakdown of the classes we observed, by school and by class type (CTE or academic). We only observed non-CTE, non-academic courses (e.g., chorus) when they were part of a shadowed student's schedule. There were only four such classes across all four years. As with the interviews, in the latter years of the study, we sought to observe classes that had specifically not been mentioned by anyone, so as to broaden our perspective.

Table A2
Total classroom observations conducted

	Classes Observed		
	CTE	*Academic*	*Total*
School	N	N	N
Academy High School	12	31	43
Academy Middle School	3	17	20
Pathways High School	22	35	57
Pathways Middle School	5	18	23
Pathways Regional Skills Center	2	N/A	2
Vocational High School	17	16	33
Vocational Middle School	2	5	7
Totals	63	122	185

Although we observed 185 classes, we do not have time interval sheets or directed question forms for all 185. Circumstances sometimes prevented us from completing one or more of the forms. Overall, we collected 102 time interval sheets (55%) and 86 directed question forms (46%) from the 185 observations. Table A3 below shows the number of classes for which we collected each instrument, along with the percentage of observations it represents. From this table, we see that an overall high of 100% of both time interval sheets and directed question forms from CTE classes were collected at AMS, and an overall low of 17% of the directed question forms for academic classes from PMS were collected. Among the high schools, the range was a low of 35% of time interval sheets for CTE classes at VHS, and a high of 71% of time interval sheets for academic classes at AHS.

Table A3
Classroom observation instruments collected at the sites

	CTE Classes		*Academic Classes*		*Total Classes*
Observation Instruments	N	%	N	%	N
Academy High School					
Time interval sheet	8	67	22	71	30
Directed question form	6	50	16	52	22
Academy Middle School					
Time interval sheet	3	100	5	29	8
Directed question form	3	100	4	24	7
Pathways High School					
Time interval sheet	11	50	19	54	30
Directed question form	9	41	18	51	27
Pathways Middle School					
Time interval sheet	4	80	11	61	15
Directed question form	3	60	3	17	6
Vocational High School					
Time interval sheet	6	35	8	50	14
Directed question form	8	47	10	63	18
Vocational Middle School					
Time interval sheet	1	50	4	80	5
Directed question form	1	50	5	100	6

Qualitative Data Analyses

Validity and Reliability

There were four observation instrument reliability checks, each involving three or four research team members. The first check was before data collection began, and involved a video-taped CTE course. Only time interval sheets were collected for the videotaped reliability check. The remaining three reliability checks occurred at different sites during the study, and at different times, reflecting the arrival of new team members. The classes we observed for the reliability checks were an English class, a media class, and a science class. After each of these classroom observations, the research instruments were collected. These responses showed an overall average inter-researcher agreement level of 78%. Research team responses on the time interval sheets were merged together onto one sheet, and like responses were tallied. The responses showed an overall inter-researcher agreement level of 88% for Section A, 72% for Section B, and 81% for Section C.

We also conducted four inter-researcher agreement ratings of our analytical coding of interview transcripts. The first three checks were conducted as the coding team was establishing its guidelines for the coding process. Four of the five researchers each coded three transcripts, one from each high school. These coded transcripts were then compared, code by code. If a code was found next to an interviewee comment on one researcher's transcript, it was sought on the other transcripts in the same place. An agreement between two, three, or all four researchers was possible. Such agreements were tallied and a percentage produced. Note that only agreement among researchers was being estimated, and not the appropriateness of the code for that particular comment. The results for these first three reliability checks ranged from 39-45% agreement. In reviewing the results, it appeared as though one team member was undercoding and another was coding overly zealously. Both members continued training. Some time into the coding process, we conducted another reliability check. By then, the "zealous coder" had left the analysis team. Among the three remaining coders, the agreement rating for that final reliability check was 74%. These were the three coders who coded the vast majority of the transcript and observation data.

What is the practical significance of converging reliably onto a coding level "less zealous" than that of the zealous coder? We acknowledge that some data that should have been coded might have eluded us. On the other hand, if we had coded every mention of every topic, the reports produced by HyperResearch would have been too large and unwieldy for the axial coding analysis, and they would have contained extraneous data. Instead, we created coding guidelines. We chose to depend on the researcher's eye while coding to distinguish content-ful data from extraneous data, and not to code the extraneous data. For example, all four researchers coded the following section of a transcript as "interviewee background" and "teacher qualification," but only the zealous coder also included "math" and "science." Because no information appears in this comment that could help us understand math or science at AHS, it did not warrant those codes attached to it.

> *Researcher:* Why don't we start with your teaching experience?
>
> *CTE teacher:* I've only taught in this district. I started in the elementary school and I taught third and fifth grades, and there was a big reorganization in our district where all the sixth graders moved up to middle school. And the middle school here was [Grades] 7, 8, and 9, and so then at that same time, all the 9th graders moved up to high school, and I actually was planning on coming to the middle school with the 6th graders. I wanted to core in math and science, and that was the way they were going to filter the kids in, so it wouldn't be such a shock for them to go to all of a sudden having six different teachers. They were going to have them have two teachers and they were going to core in math and science and in language and social studies. So anyway, I taught in the middle school for two years in science, because they needed a science teacher and I had been doing this articulation program in my elementary school with the middle school teachers. So I already knew people in the math and science department and they thought, even though she doesn't have a science credential, we'd rather have someone we know than someone we don't know. So the principal convinced me and they wrote a waiver because I don't have the science credential. I have a

K to 12, actually K to adult, but I hadn't had enough units as a single subject teacher.

The coding was a mammoth task that had to be delimited in some way. We believe that we captured the major topics in the transcripts, and we reached a high reliability rating. Overall, the results of all of our reliability exercises satisfied us that the entire classroom observation protocol and the training we provided functioned to ensure reliable qualitative data.

Descriptive Analyses

Student Samples: High School Engagement and Achievement

For our analyses of high school engagement and achievement, we used data from the 9th-grade cohort. This group provided our best data on the full four-year high school experience of students at these schools. Unlike at the other sites, at AHS we were provided with a de facto random assignment design. AHS used a lottery system to select students from its middle school (AMS), allowing us to construct four comparison groups. There were two comparison groups that had attended AMS, one of which had applied but not been admitted to AHS. This became the main comparison group. We called this group C-AHS. Appendix D provides the results of all other AHS comparison groups besides C-AHS, including the comparison school as a whole. However, as with the main body of the report, we will only discuss C-AHS here.

The background characteristics of the 9th-grade cohorts from each school are shown in Table A4. For each comparison, we compared the two groups of students for significant differences in background characteristics. We found that there were more African American students, fewer Latino students, and fewer Limited English Proficient (LEP) students at AHS than at C-AHS.

Table A4
Ninth-grade cohort (2004) background characteristics

School	N	*Female* %	*Male* %		*Asian* %	*Black* %		*Latino* %		*White* %		*Other* %	*Special Education* %		*LEP Status* %		*Free/Reduced Lunch Status* %	
AHS	186	59.1	40.9		0.5	22.0		76.3		0.5		0.5	7.5		49.5		85.5	
C-AHS	95	49.5	50.5		0.0	5.3	*	94.7	*	0.0		0.0	5.3		85.3	*	86.3	
PHS	528	49.2	50.8		0.9	4.4		67.0		27.3		0.0	14.2		33.9		66.3	
C-PHS	368	48.9	51.1		1.4	0.0	*	69.0		29.6		0.0	11.7		18.5	*	53.0	*
VHS	352	42.9	57.1		0.6	26.1		63.1		10.2		0.0	40.9		4.5		68.8	
C-VHS	361	51.8	48.2	*	1.7	38.2	*	43.8	*	16.3	*	0.0	19.7	*	3.9		53.7	*

Note. Significance level indicates difference between study and comparison schools.
**p* < .05.

There were more African American students, more LEP students, and more students participating in the free/reduced-price lunch program at PHS than at C-PHS. There were more male students, fewer African American students, more Latino students, fewer White students, more special education students, and more students in the free/reduced-price lunch program at VHS than at C-VHS.

Postsecondary Transition

For our analyses of postsecondary transition, we used data from the 11th-grade cohort. As with the 9th-grade cohort, the lottery selection process at AHS provided an opportunity to create a de facto random assignment design for the 11th-grade cohort. The main comparison group includes the students who attended AMS (whether or not they applied to attend AHS). All background information and outcomes on the other AHS comparison groups are found in Appendix D. Here, we mirror the main body of the report, which focuses on C-AHS, since those students constituted the best comparison group for AHS students.

The background characteristics of the 11th-grade cohort are shown in Table A5. We found that there were fewer males, fewer special education students, and fewer LEP students at AHS than at C-AHS. At PHS, the 11th-grade cohort consisted of more African American students, more White students, and fewer Latino students than at C-PHS. At VHS, the comparison for the 11th-grade cohort was the same as that for the 9th-grade cohort: more male students, fewer African American students, more Latino students, more special education students, and more students participating in the free or reduced-price lunch program at VHS than at C-VHS.

Table A5
Eleventh-grade cohort (2002) background characteristics

School	N	*Female* %	*Male* %		*Asian* %	*Black* %		*Latino* %		*White* %		*Other* %	*Special Education* %		*LEP Status* %		*Free/Reduced Lunch Status* %	
AHS	109	64.2	35.8		0.0	21.1		78.0		0.0		0.0	5.5		54.1		86.2	
C-AHS	154	50.6	49.4	*	0.0	24.0		76.0		0.0		0.0	19.5	*	70.8	*	88.3	
PHS	372	51.1	48.9		3.0	4.0		42.7		49.2		0.8	8.9		15.1		38.7	
C-PHS	219	50.2	49.8		1.8	0.5	*	69.4	*	28.3	*	0.0	7.3		14.6		34.7	
VHS	221	49.8	50.2		2.7	30.8		48.4		18.1		0.0	25.8		1.8		28.1	
C-VHS	193	62.2	37.8	*	2.1	50.8	*	31.6	*	15.5		0.0	10.9	*	5.2		9.3	*

Note. Significance level indicates difference between study and comparison schools.
$^{*}p < .05$.

Descriptive data on the senior survey respondents from each comparison are shown in

Tables A6, A7, and A8, respectively. Comparisons were performed for gender, race, ethnicity, free/reduced-price lunch status, LEP status, and special education status. Our analyses revealed that AHS had significantly smaller percentages of LEP and special education students completing senior surveys than C-AHS did.

Table A6

Background characteristics of senior survey respondents, AHS site, Class of 2002

	AHS		*C-AHS*		
Demographics	N	%	N	%	
Total	90		55		
Gender					
Male	33	37	25	46	
Female	57	63	30	55	
Ethnicity					
African American	17	19	10	18	
Latino	72	80	45	82	
Free/Reduced Lunch					
Yes	80	89	52	95	
No	10	11	3	6	
Limited English Proficiency					
Yes	51	57	42	76	*
No	39	43	13	24	*
Special Education					
Yes	1	1	5	9	*
No	89	99	50	91	*

Note. AHS had a significantly smaller percentage of LEP students than C-AHS, χ^2 (1, 145) = 5.76, $p < .05$.
AHS had significantly fewer special education students than C-AHS, χ^2 (1, 145) = 5.48, $p < .05$.
*$p < .05$.

Table A7 compares the senior survey sample at PHS and C-PHS on key background characteristics. We found three significant differences: PHS had fewer Latino students completing the senior survey than C-PHS. Conversely, there were significantly more White students and African American students completing the senior survey at PHS than at C-PHS, although the overall number of African American students was very small at both schools.

Table A7

Background characteristics of senior survey respondents, PHS site, Class of 2002

	PHS		*C-PHS*		
Demographics	N	%	N	%	
Total	198		174		
Gender					
Male	91	46	82	47	
Female	107	54	92	53	
Ethnicity					
Asian	3	2	2	1	
African American	9	5	1	1	*
Latino	82	41	119	68	***
White	102	52	52	30	***
Other	2	1	0	0	
Free/Reduced Lunch					
Yes	75	38	60	35	
No	123	62	114	66	
Limited English Proficiency					
Yes	31	16	25	14	
No	167	84	149	86	
Special Education					
Yes	5	3	11	6	
No	193	98	163	94	

Note. Due to missing data, percentages may not add up to 100. Significance levels are based on chi-square analyses comparing treatment and control schools. At PHS, there were significantly more African American students, $\chi^2(1, 372) = 5.58$, $p < .05$; significantly fewer Latino students, $\chi^2(1, 372) = 27.14$, $p < .001$; and significantly more White students, $\chi^2(1, 372) = 17.86$, $p < .001$ than at C-PHS.
*$p < .05$. ***$p < .001$.

Table A8
Background characteristics of senior survey respondents, VHS site, Class of 2002

	VHS		*C-VHS*		
Demographics	N	%	N	%	
Total	166		133		
Gender					
Male	78	47	50	38	
Female	88	53	83	62	
Ethnicity					
Asian	4	2	3	2	
African American	52	31	71	53	***
Latino	79	48	40	30	**
White	31	19	19	14	
Free/Reduced Lunch					
Yes	39	24	10	8	***
No	127	77	123	93	***
Limited English Proficiency					
Yes	4	2	6	5	
No	162	98	127	96	
Special Education					
Yes	46	28	17	13	**
No	120	72	116	87	**

Note. There were significantly fewer African American students at VHS than at C-VHS, $\chi^2(1, 299) = 14.84$, $p < .001$. There were significantly more Latino students at C-VHS than at VHS, $\chi^2(1, 299) = 9.46$, $p < .01$. VHS had a significantly greater percentage of free-lunch-eligible students than C-VHS (8%), $\chi^2(1, 299) = 13.75$, $p < .001$. There were significantly more special education students at VHS than at C-VHS, $\chi^2(1, 299) = 9.90$, $p < .01$.
$^{**}p < .01$. $^{***}p < .001$.

Finally, we compared the senior survey samples at VHS and C-VHS. A number of significant differences appeared between the two samples (see Table A8). Significantly fewer African American students but more Latino students took the senior survey at VHS than at C-VHS. Students from VHS who completed the senior survey were significantly more likely to have participated in the free/reduced-price lunch program and to have received special education services than students from C-VHS who completed the senior survey.

Data on postsecondary education outcomes were provided for those members of the 11th-grade cohorts who attended their local community college. At the AHS and VHS sites, both study and comparison school students attended the same community college (ACC and VCC, respectively). At the PHS site, the comparison school students could attend one of two community colleges, both of which provided data for this study (PCC and CCC).

We tested the sample of students from AHS and C-AHS who attended ACC to determine, in each case, if they were representative of their graduating class, or if there were any differences between those graduates who attended ACC and those who did not. In these analyses, we found that both AHS and C-AHS graduates who attended ACC reflected their respective graduating classes demographically, and were not significantly different demographically from their peers who did not attend ACC (see Table A9).

Table A9

Background characteristics of AHS site students who graduated from high school and attended ACC versus those who graduated from high school and did not attend ACC, 11th-grade cohort

	AHS						*C-AHS*					
	Attended ACC		*Did not attend ACC*		*Total*		*Attended ACC*		*Did not attend ACC*		*Total*	
Demographics	N	%	N	%	N	%	N	%	N	%	N	%
Total	13	13	85	87	98		11	13	75	87	86	
Gender												
Male	6	46	28	33	34	35	6	55	31	41	37	43
Female	7	54	57	67	64	65	5	46	44	59	49	57
Ethnicity												
African American	2	15	18	21	20	21	0	0	20	27	20	23
Latino	11	85	66	79	77	79	11	100	55	73	66	77
Free/Reduced Lunch												
Yes	12	92	75	88	87	89	10	91	68	91	78	91
No	1	8	10	12	11	11	1	9	7	9	8	9
LEP												
Yes	8	62	48	57	56	57	10	91	50	67	60	70
No	5	39	37	44	43	43	1	9	25	33	26	30
Special Education												
Yes	0	0	1	1	1	1	1	9	8	11	9	1
No	13	100	84	99	97	99	10	91	67	89	77	89

Note. A significant difference in ethnicity was found: there were more African American students among those not attending ACC from C-AHS, $\chi^2(1, 323) = 6.19$, $p < .05$, and more Latino students attending ACC from C-AHS, $\chi^2(1, 323) = 6.45$, $p < .05$. There were more LEP students from C-AHS attending ACC than not attending ACC, $\chi^2(1, 323) = 5.95$, $p < .05$.
LEP = Limited English Proficiency.

In a similar manner, we tested the samples of students from PHS and C-PHS who attended their local community colleges to determine if they were representative of their respective graduating classes (see Table A10). In these analyses, we found that the comparison school students (C-PHS) who attended either community college reflected both the graduating class as a whole and their C-PHS peers who did not attend either college. At PHS, students who attended PCC reflected the PHS graduating class as a whole, but there were some differences between the PCC sample and the non-PCC sample: those PHS students who attended PCC were significantly less likely to have received LEP services or special education services in high school than students who did not attend PCC. Fully 39% of all PHS graduates attended PCC. PCC was the closest postsecondary option in this agricultural area, and was a popular choice among PHS graduates. It should be noted, though, that less than one-third of the PHS graduates who went to PCC were Latino.

Table A10

Background characteristics of PHS site students who graduated from high school and attended PCC or CCC versus those who graduated from high school and did not attend PCC or CCC, 11th-grade cohort

	PHS							*C-PHS*					
	Attended PCC		*Did not attend PCC*			*Total*		*Attended PCC or CCC*		*Did not attend PCC or CCC*		*Total*	
Demographics	N	%	N	%		N	%	N	%	N	%	N	%
Total	107	39	169	61		276		41	22	149	78	190	
Gender													
Male	44	41	75	44		119	43	18	44	75	50	93	49
Female	63	59	94	56		157	57	23	56	74	50	97	51
Ethnicity													
Asian	3	3	6	4		9	3	0	0	2	1	2	1
African American	5	5	5	3		10	4	0	0	1	1	1	1
Latino	30	28	66	39		96	35	29	71	100	67	129	68
White	68	64	91	54		159	58	12	29	46	31	58	31
Other	1	1	1	1		2	1	0	0	0	0	0	0
Free/Reduced Lunch													
Yes	29	27	56	33		85	31	15	37	52	35	67	35
No	78	73	113	67		191	69	26	63	97	65	123	65
LEP													
Yes	5	5	27	16	**	32	12	2	5	23	15	25	13
No	102	95	142	84	**	244	88	39	95	126	85	165	87
Special Education													
Yes	4	3	18	11	*	22	8	1	2	10	7	11	6
No	103	96	151	89	*	254	92	40	98	139	93	179	94

Note. There were fewer LEP students from PHS attending PCC or CCC than not attending PCC or CCC, $\chi^2(1, 276) = 8.17$, $p < .01$. There were fewer special education students from PHS attending PCC or CCC than not attending PCC or CCC, $\chi^2(1, 276) = 4.27$, $p < .05$.
LEP = Limited English Proficiency.
**p* < .05. ***p* < .01.

Finally, we tested the samples of students from VHS and C-VHS who attended VCC to determine if they were each representative of their respective graduating classes. We found that the C-VHS students who attended VCC reflected both the non-VCC sample and the C-VHS graduating class as a whole (see Table A11). Similarly, the VHS students who attended VCC reflected the entire VHS graduating class demographically, but there were some differences between the VHS students who attended VCC and those who did not. VHS graduates who attended VCC were significantly less likely to have received special education services in high school than those who did not. Both VCC samples were predominantly female.

Table A11

Background characteristics of VHS site students who graduated from high school and attended VCC versus those who graduated from high school and did not attend VCC, 11th-grade cohort

	VHS							*C-VHS*					
	Attended VCC		*Did not attend VCC*			*Total*		*Attended VCC*		*Did not attend VCC*		*Total*	
Demographics	N	%	N	%		N	%	N	%	N	%	N	%
Total	43	25	129	75		172		53	34	102	66	155	
Gender													
Male	18	42	62	48		80	47	17	32	39	38	56	36
Female	25	58	67	52		92	54	36	68	63	62	99	64
Ethnicity													
Asian	0	0	5	4		5	3	0	0	4	4	4	3
African American	18	42	35	27		53	31	27	51	53	53	80	52
Latino	18	42	61	47		79	46	22	42	26	26	48	31
White	7	16	28	22		35	20	4	8	19	19	23	15
Free/Reduced Lunch													
Yes	11	26	34	26		45	26	6	11	7	7	13	8
No	32	74	95	74		127	74	47	88	95	93	142	92
LEP													
Yes	0	0	3	2		3	2	2	4	3	2	5	3
No	43	100	126	98		169	98	51	96	99	97	150	97
Special Education													
Yes	5	12	42	33	**	47	27	7	13	11	11	18	12
No	38	88	87	67	**	125	73	46	87	91	89	137	88

Note. There were fewer special education students from VHS attending VCC than not attending VCC, χ^2 (1, 172) = 7.11, $p < .01$.
LEP = Limited English Proficiency.
*$p < .05$. ***$p < .001$.

Measures and Analyses

As a supplement to the information provided in Chapter 2, in Tables A12-A14 we provide descriptive data on student status at each of the three study schools and their comparison schools.

Table A12
Student status – AHS site

Status	*AHS students (N = 186)*		*All C-AHS-total (N = 1111)*			*C-AHS-total students who attended Academy Middle School (AMS)*: *C-AHS-total who attended AMS (N = 279)*			*C-AHS-total who applied to AHS (N = 95)*			*C-AHS-total who did not apply to AHS (N = 184)*			*C-AHS-total who did not attend AMS (N = 832)*		
	N	%	N	%		N	%		N	%		N	%		N	%	
Left study after 1 yr	21	11.3	382	34.4	*	53	19.0	*	16	16.8		37	20.1	*	329	39.5	*
Transfer	14	66.7	153	40.1	*	25	47.2		12	75.0		13	35.1	*	128	38.9	*
Ill/Deceased	0	0.0	0	0.0		0	0.0		0	0.0		0	0.0		0	0.0	
Unknown	7	33.3	229	59.9	*	28	52.8		4	25.0		24	64.9	*	20	61.1	*
Stayed in study after 1 yr	165	88.7	729	65.6	*	226	81.0	*	79	83.2		147	79.9	*	503	60.5	*
Moved into next grade	122	73.9	716	98.2	*	224	99.1	*	79	100.0	*	145	98.6	*	492	97.8	*
Repeated grade	43	26.1	13	1.8	*	2	0.9	*	0	0.0	*	2	1.4	*	11	2.2	*
Left study after 2 yrs	18	9.7	181	16.3	*	53	19.0	*	14	14.7		39	21.2	*	128	15.4	*
Transfer	10	55.6	62	34.3		23	43.4		7	50.0		16	41.0		39	30.5	*
Ill/Deceased	0	0.0	0	0.0		0	0.0		0	0.0		0	0.0		0	0.0	
Unknown	8	44.4	119	65.7		30	56.6		7	50.0		23	59.0		89	69.5	*
Stayed in study after 2 yrs	147	79.0	548	49.3	*	173	62.0	*	65	68.4	*	108	58.7	*	375	45.1	*
Moved into next grade	127	86.4	537	98.0	*	172	99.4	*	65	100.0	*	107	99.1	*	365	97.3	*
Repeated grade	20	13.6	11	2.0	*	1	0.6	*	0	0.0	*	1	0.9	*	10	2.7	*
Left study after 3 yrs	17	9.1	199	17.9	*	57	20.4	*	16	16.8	*	41	22.3	*	142	17.1	*
Transfer	3	17.6	97	48.7	*	29	50.9	*	9	56.3	*	20	48.8	*	68	47.9	*
Ill/Deceased	0	0.0	0	0.0		0	0.0		0	0.0		0	0.0		0	0.0	
Unknown	14	82.4	100	50.3	*	28	49.1	*	7	43.8	*	21	51.2	*	72	50.7	*
Grad	0	0.0	2	1.0													
Stayed in study after 3 yrs	130	69.9	349	31.4	*	116	41.6	*	49	51.6	*	67	36.4	*	233	28.0	*
Moved into next grade	122	93.8	346	99.1		116	100.0	*	49	100.0		67	100.0	*	230	98.7	*
Repeated grade	8	6.2	3	0.9	*	0	0.0	*							3	1.3	*
Left study after 4 yrs	121	65.1	329	29.6	*	114	40.9	*	49	51.6	*	65	35.3	*	215	25.8	*
Transfer	0	0.0	0	0.0		0	0.0		0	0.0		0	0.0		0	0.0	
Ill/Deceased	0	0.0	0	0.0		0	0.0		0	0.0		0	0.0		0	0.0	
Unknown	0	0.0	0	0.0		0	0.0		0	0.0		0	0.0		0	0.0	
Grad	121	100.0	329	100.0		114	100.0		49	100.0		65	100.0		215	100.0	
Stayed in study after 4 yrs	9	4.8	20	1.8	*	2	0.7	*	0	0.0	*	2	1.1	*	18	2.2	*

*$p < .05$.

Table A13
Student status – PHS site

Status	PHS (N = 528) N	PHS (N = 528) %	C-PHS (N = 368) N	C-PHS (N = 368) %	
Left study after 1 year	134	25.4	53	14.4	*
Transfer	59	44.0	26	49.1	
Dropout	31	23.1	8	15.1	
Ill/Deceased	0	0.0	0	0.0	
GED	1	0.7	0	0.0	
Unknown	43	32.1	19	35.8	
Stayed in study after 1 year	394	74.6	315	85.6	*
Moved into next grade	295	74.9	312	99.0	
Repeated grade	99	25.1	3	1.0	
Left study after 2 years	95	18.0	19	5.2	*
Transfer	45	47.4	8	42.1	
Dropout	39	41.1	4	21.1	
Ill/Deceased	0	0.0	0	0.0	
GED	3	3.2	0	0.0	
Unknown	7	7.4	7	36.8	*
Graduated	1	1.1	0	0.0	
Stayed in study after 2 years	299	56.6	296	80.4	*
Moved into next grade	222	74.2	285	96.3	
Repeated grade	77	25.8	11	3.7	
Total in third year of study					
Left study after 3 years	52	9.8	25	6.8	
Transfer	13	25.0	19	76.0	*
Dropout	4	7.7	3	12.0	
Ill/Deceased	0	0.0	0	0.0	
Unknown	35	67.3	3	12.0	*
Stayed in study after 3 years	247	46.8	271	73.6	*
Moved into next grade	181	73.3	242	89.3	
Repeated grade	66	26.7	29	10.7	
Total in fourth year of study					
Left study after 4 years	179	33.9	227	61.7	*
Transfer	0	0.0	0	0.0	
Dropout	0	0.0	0	0.0	
Ill/Deceased	0	0.0	0	0.0	
Unknown	0	0.0	0	0.0	
Graduated	179	100.0	227	100.0	
Stayed in study after 4 years	68	12.9	44	12.0	

*$p < .05$.

Table A14
Student status - VHS site

Status	VHS (N = 352) N	VHS (N = 352) %	C-VHS (N = 361) N	C-VHS (N = 361) %	
Left study after 1 year	83	23.6	90	24.9	
Transfer	39	47.0	58	64.4	*
Dropout	36	43.4	29	32.2	
Ill/Deceased	0	0.0	0	0.0	
Unknown	8	9.6	3	3.3	*
Stayed in study after 1 year	269	76.4	271	75.1	
Moved into next grade	210	78.1	196	72.6	
Repeated grade	59	21.9	75	27.7	
Left study after 2 years	93	26.4	75	20.8	
Transfer	32	34.4	32	42.7	
Dropout	50	53.8	39	52.0	
Ill/Deceased	0	0.0	0	0.0	
Unknown	10	10.8	3	4.0	
Graduated	1	1.1	1	1.3	
Stayed in study after 2 years	176	50.0	196	54.3	*
Moved into next grade	146	17.0	144	73.5	
Repeated grade	30	83.0	52	26.5	
Left study after 3 years	36	10.2	52	14.4	
Transfer	13	36.1	23	44.2	
Dropout	20	55.6	19	36.5	
Ill/Deceased	2	5.6	0	0.0	
Unknown	1	2.8	10	19.2	
Graduated	0	0.0	0	0.1	
Stayed in study after 3 years	140	39.8	144	39.9	
Moved into next grade	135	96.4	132	91.7	
Repeated grade	5	3.6	12	8.3	
Left study after 4 years	109	31.0	126	34.9	
Transfer	0	0.0	0	0.0	
Dropout	0	0.0	0	0.0	
Ill/Deceased	0	0.0	0	0.0	
Unknown	0	0.0	0	0.0	
Graduated	109	100.0	126	100.0	
Stayed in school after 4 years	31	8.8	18	5.0	

*$p < .05$.

Figure A1
Time Interval Sheet

Record your observations in eight-minute intervals. One minute after the bell rings, take the next minute to observe the classroom activity and record your observation (circle it). Do this again eight minutes later and so on for the duration of the class.

School name:	
Teacher name:	
Class title:	
Date:	
Time:	
Observer:	

Segment	**Actual Time**
1	
2	
3	
4	
5	
6	
7	
8	
9	

A. Orientations									
Teacher-led	1	2	3	4	5	6	7	8	9
Team teaching	1	2	3	4	5	6	7	8	9
Independent	1	2	3	4	5	6	7	8	9
Small group	1	2	3	4	5	6	7	8	9
Pairs	1	2	3	4	5	6	7	8	9
Student-led	1	2	3	4	5	6	7	8	9
Media-led	1	2	3	4	5	6	7	8	9
Project-based	1	2	3	4	5	6	7	8	9
B. Student attention-engagement (how many students are on task, whatever the task)									
100%	1	2	3	4	5	6	7	8	9
80%	1	2	3	4	5	6	7	8	9
60%	1	2	3	4	5	6	7	8	9
40%	1	2	3	4	5	6	7	8	9
20% or less	1	2	3	4	5	6	7	8	9

continued on next page

C. Overall Observation	None	Some	Extensive
Direct instruction by teacher	N	S	E
Independent work by students	N	S	E
Teacher provided feedback (answers, information, etc.)	N	S	E
Students engaged in relevant dialogue with each other or with teacher	N	S	E
Sustained writing	N	S	E
Computer used as tool or resource	N	S	E
Other technology used as tool or resource (which?)	N	S	E
Experiential, hands-on learning	N	S	E
Challenging activities	N	S	E
Alternative assessment strategies	N	S	E
Teacher acted as coach/facilitator	N	S	E
Discipline problems	N	S	E

Figure A2
Directed Question Form

School Name: ______________________________ Class Title: ___________________________

Observer: _________________________________ Date: ________________________________

Teacher: __________________________________ Time: ________________________________

For each classroom you observe, please answer the following questions. If you do not see the element asked about, state what you saw instead. Provide DETAILED EXAMPLES to support your conclusions. Descriptive adjectives and specific details of the way a student looked or quotes or paraphrased recollections of a teacher's remark are always helpful. Remember: In qualitative observations it's the details, details, details of life in these classrooms that we want to capture. If you run out of room in the space provided, use the back of the sheet. Be specific in your observations, as we will code your responses during subsequent analysis.

Attach any materials from the class that you gathered during the observation period, such as worksheets or copies of student work.

Just answer those questions that relate to the class you observed (General Classroom, New Basics, SCANS skills, etc.). You may be in an academic subject class, where some questions are simply not applicable. If so, please describe why (i.e., "n/a because this was a Spanish class," etc.)

PART I: General Classroom/Lab/Shop

I1. The Students (# of students, race, gender)

I2. The Teacher (approximate age or experience level, race, gender, demeanor, level of engagement)

I3. Class Description Briefly, what was this class about? What was the subject? What was the topic for today?

I4a. Facilities, Resources, and Climate (Adequate space for everyone? Lighting? Books? How is the state of repair/disrepair?)

I4b. Describe and comment on the use of computer-based educational technology as part of classroom instruction.

I4c. Describe the technology in the classroom/shop/lab. Does it appear to be state-of-the-art? Describe how the students were interacting with the technology (the extent to which it was used at all, the level of student engagement with it, etc.). If possible, ask the teacher if the technology is adequate for the purpose of the class.

PART II: Urban Learning Centers/Career Pathways/High Schools That Work

Urban Learning Centers (AHS)

II.1. Interdisciplinary Curriculum

II1a. Did the teacher incorporate concepts from both academic and vocational education? Describe. (For example, did a math teacher use an example from an academy topic, did the computer teacher say part of the students' grade on an assignment/project would be based on their spelling and punctuation, etc.)

II1b. Was there evidence that teachers teamed *across classes* to relate subject matter (i.e., to integrate vocational and academic curricula)? Describe.

Career Pathways (PHS)

IIa. Was this class a component of a specific pathway? (A journalism class could be a component of the communications pathway, whereas an Algebra class likely would not be geared toward a specific pathway.) Was the class comprised of students primarily or exclusively from a specific pathway? Could you tell, or did you have to ask?

IIb. Did students work on pathway-related activities in this class? This could be their grade-level projects, or it could be various projects assigned/chosen according to the students' pathways, etc. If so, describe.

IIc. Were any other references made to career pathways that weren't covered in the previous questions (e.g., a teacher directed students' attention to some facet of the lesson/activity based on the pathway the students are in, students described career plans, etc.). If so, please describe.

High Schools That Work (VHS)

II.1. Blending Academic and Vocational Education

II1a. Did the teacher (academic or vocational) incorporate concepts from "the other side"? Describe. (For example, did a math teacher use a workplace example, did the computer or print shop teacher say that part of the students' grade on an assignment/project would be based on their spelling and punctuation, etc.)

II.2. Attention to Assessment

II2a. Did you see any assessment going on in the class? If so, describe. Did you see the use of portfolios, demonstrations, or exhibits?

II2b. Did the assessments focus on academic *and* technical proficiencies? Example?

PART III: SCANS Skills

Workplace Competencies

III1a. Did students work as teams on projects or activities? (This is more than just working in groups to answer questions at the end of the chapter.) If so, look for and describe the following:

- Were the teams representative of the diversity of the class?
- Did students appear to work well together?
- Were students teaching other students?
- Were students negotiating solutions to problems?
- Were students leading the team toward completion of team goals?
- Did most students contribute, act responsibly during the activity?
- Describe the activity requiring teamwork.

III1b. Did the activity require the management of time, money, materials, or human resources? Was there any evidence that students took any of these into account in their work?

III1c. In what ways did the students work with information? (Discuss all that apply: acquire, evaluate, organize, maintain, interpret, or communicate information, use computers to process information.) Or did the teacher/textbook just supply or transmit information that the students simply reproduced?

III1d. Was there evidence that students had to learn about, know, or know how to act upon the social, organizational, and/or technological systems in this class? Describe.

III1e. Were students responsible for selecting the appropriate tools or equipment to complete a task? Were they responsible for maintaining or troubleshooting these?

Basic Skills, Thinking Skills

III2a. Did you observe any student reading? If so, describe the text (i.e., did it include graphs, charts, etc.). Did it seem age-appropriate, or challenging for this age group? Were students able to find out the meaning of unknown words on their own, or did they depend on the teacher? Could students do the reading?

III2b. Did you observe any student writing? If so, describe the text (i.e., did it include graphs, charts, etc.), its level of sophistication, and the level of challenge for the students in the class. Was the style and organization appropriate for the subject matter, purpose, and audience? Was the grammar and spelling correct?

III2c. Did you observe any arithmetic or mathematics? If so, describe. Did it seem age-appropriate, or challenging for this age group? Could students understand the concepts? Could they do the math?

III2d. Did students participate in discussions or presentations? Was their language appropriate for the subject matter, purpose, and audience? Was the presentation effective?

III2e. Was decision-making part of any class activities? If so, describe the activity. Was the focus of the decision-making based on an authentic problem or a contrived one?

PART IV: Restructured Teaching and Learning (cf. Newmann & Wehlage, 1995)

IVa. Were students conducting disciplined inquiry (employing prior knowledge in complex cognitive work, using language in extended complex ways to communicate their ideas)? Explain how you know this.

IVb. Were students engaging in higher-order thinking skills (synthesizing, hypothesizing, producing new meaning)? Were they acquiring deep knowledge (a thorough exploration)? Explain how you know this.

IVc. Was the focus of the class (assignment, discussion) ever on issues or problems connected to the local community (i.e., making connections to the world beyond the classroom) as opposed to textbook-driven? Explain how you know this.

IVd. During the course of the class, were students engaged in producing a “product” that would have value or use beyond the classroom (i.e., something good not only for assessing student learning with intrinsic value, like a boat, original writings to be published, food products, a physical item, a performance, etc.). Is the intended audience beyond the classroom? Explain how you know this.

PART V: Career and Technical Education Reform Elements

Work Based Learning (WBL)

V1a. Were student work experiences used as the basis for academic activities or assignments (i.e., journal writing)? Do you know if this work experience was connected to the class?

V1b. Did students bring up their WBL experiences? If so, what did they say?

Postsecondary and Business Partnerships

V2a. Did you see any evidence of postsecondary or business partnerships during this class? Please describe.

V2b. Were students exposed to related postsecondary education or training during this class (e.g., was it mentioned)?

V.3. Miscellaneous CTE

For VHS and PHS (II1B for AHS). Was there evidence that teachers worked *across classes* to relate subject matter (i.e., to integrate vocational and academic curricula)?

V3a. Were any of the students in a program nontraditional for their gender (e.g., females in auto body, males in cosmetology)?

V3b. Were “all aspects of an industry”a part of the class discussion or activity? (For example, was there discussion of management, financial, labor, or environmental issues associated with the industry, such as the environmental impact of certain construction techniques in a carpentry class, or the role of unions in any of the classes, etc.)

V3c. Was the local labor market the focus of class discussion/activities, or was the class generic, so that it could have been sited anywhere in the U.S.?

V3d. Did you observe any of the following? If so, describe.

- Education *for* work – skill development, such as learning how to weld.
- Education *about* work – what salaries different jobs get, employer expectations, etc.
- Education *through* work – using a student's McDonald's or internship experience to make a point or teach something in social studies or other academic area.

PART VI: General Classroom Culture

VI.1. Pedagogy

VI1a. With respect to teacher-student interaction, who tended to initiate it (student or teacher)? Did it tend to be low-level talk, such as clarifications or known-answer questions, or higher-level talk (making connections, communicating ideas)?

VI1b. What evidence was there that the teacher used multiple instructional strategies? (e.g., group, pair, or project work vs. traditional lecturing, using visual images, manipulatives, etc.)

VI1c. Was there any evidence that particular instructional strategies worked better for or were targeted to particular cultural or linguistic student groups?

VI1d. Was there evidence of lesson planning and teacher time management? Was there evidence of students' understanding? Did they have the appropriate background knowledge? Did the teacher provide appropriate scaffolding?

VI.2. High Expectations

VI2a. Describe your perceptions of the *explicit* expectations for this class (academic or vocational as appropriate). Did it seem to be a reasonably demanding set of tasks for these kids? What would you say were the *implicit* expectations that the teacher had of the students? Did the expectations seem to be equally demanding for white and minority students? Explain how you know this.

VI2b. Was there any evidence that students were being held to specific academic or technical standards?

VI.3. Assessment

VI3a. Did you see any assessment going on in the class? If so, describe. Did you see the use of portfolios, demonstrations, or exhibits? Or quizzes, tests, observations, etc?

VI3b. Did the assessments focus on academic *and* technical proficiencies where relevant? Example?

PART VII: Brief Descriptions

VII.1. Unusual Classroom Activities

Please use the space below to note any unusual classroom activities that were not captured by the questions above.

VII.2. Reflections

Please use this space to reflect on the classroom you observed and note your overall perceptions. Was there something about it you found particularly attractive, disturbing, dull, or unique? (Take this space to summarize your running notes).

APPENDIX B
CHAPTER 3 SUPPLEMENTAL ANALYSES

Table B1

Response rates for senior survey, AHS site, 11th-grade cohort

	12th grade in 2002	*With Survey*		*Analytic Sample*	
School	N	N	*%*	N	*%*
AHS	98	90	92	90	92
C-AHS	127	55	43	55	40

Table B2

Logistic regression predicting plans for after high school, AHS site, 11th-grade cohort, senior survey respondents

	AHS and C-AHS			
	Cox & Snell R^2 = .142 *Nagelkerke R^2 = .203* N *for model = 286* *Test of model = 43.65****			
Variable	*B*	*SE B*	*Exp(B)*	
Experiment	2.08	.46	8.04	***
Latino	-.66	.66	.52	
Male	-.14	.28	.87	
Free/Reduced Lunch	.19	.47	1.21	
Special Education	1.12	.58	3.05	
Limited English Proficiency	.14	.54	1.15	
CTE Credit Ratio	-.23	3.92	.80	
Graduation Status	6.54	15.72	693.25	
Constant	-5.79	15.73	.00	

Note. All coefficients rounded to two digits.
***$p < .001$.

Table B3
Logistic regression predicting employment, AHS site, 11th-grade cohort, senior survey respondents

	AHS and C-AHS		
	Cox & Snell R^2 = .039 Nagelkerke R^2 = .055 N for model = 272 Test of model = 10.84		
Variable	*B*	*SE B*	*Exp(B)*
Experiment	-.54	.34	.58
Latino	-.11	.52	.90
Male	.02	.27	1.03
Free/Reduced Lunch	.45	.47	1.56
Special Education	.84	.46	2.31
Limited English Proficiency	-.33	.45	.72
CTE Credit Ratio	5.39	4.01	220.11
Graduation Status	5.44	15.73	230.27
Constant	-6.62	15.74	.00

Note. All coefficients rounded to two digits.

Table B4
Logistic regression predicting full-time employment, AHS site, 11th-grade cohort, senior survey respondents

	AHS and C-AHS		
	Cox & Snell R^2 = .090 Nagelkerke R^2 = .128 N for model = 78 Test of model = 7.35		
Variable	*B*	*SE B*	*Exp(B)*
Experiment	-.09	.63	.92
Latino	1.76	1.01	5.83
Male	.46	.54	1.59
Free/Reduced Lunch	.33	.94	1.39
Special Education	-1.40	1.12	.25
Limited English Proficiency	-1.52	.83	.22
CTE Credit Ratio	-2.24	7.46	.11
Constant	-1.47	1.00	.23

Note. All coefficients rounded to two digits.

Table B5

Logistic regression predicting acceptance into the military, AHS site, 11th-grade cohort, senior survey respondents

	AHS and C-AHS Cox & Snell $R^2 = .089$ Nagelkerke $R^2 = .405$ N *for model* = 260 *Test of model* = 24.23**			
Variable	*B*	*SE B*	*Exp(B)*	
Experiment	-7.73	50.82	.00	
Latino	-6.03	39.25	.00	
Male	1.74	1.19	5.72	
Free/Reduced Lunch	.06	1.49	1.06	
Special Education	2.80	.94	16.41	**
Limited English Proficiency	4.83	39.25	125.62	
CTE Credit Ratio		11.85	.00	
Graduation	7.22	305.76	1366.54	
Constant	-11.34	305.77	.00	

Note. All coefficients rounded to two digits.
$^{**}p < .01$.

Table B6

Logistic regression predicting college acceptance, AHS site, 11th-grade cohort, senior survey respondents

	AHS and C-AHS Cox & Snell $R^2 = .231$ Nagelkerke $R^2 = .312$ N *for model* = 271 *Test of model* = 71.11***			
Variable	*B*	*SE B*	*Exp(B)*	
Experiment	2.86	.48	17.39	***
Latino	-.74	.66	.48	
Male	-.06	.29	.94	
Free/Reduced Lunch	.34	.47	1.41	
Special Education	-.53	.47	.59	
Limited English Proficiency	.61	.57	1.85	
CTE Credit Ratio	-2.98	3.98	.05	
Graduation	6.06	15.73	427.00	
Constant	-6.17	15.74	.00	

Note. All coefficients rounded to two digits.
$^{***}p < .001$.

Table B7

Logistic regression predicting full-time college attendance, AHS site, 11th-grade cohort, senior survey respondents

	AHS and C-AHS			
	Cox & Snell R^2 = .147 *Nagelkerke R^2 = .272* N *for model = 160* *Test of model = 25.48***			
Variable	*B*	*SE B*	*Exp(B)*	
Experiment	1.64	.75	5.15	*
Latino	-.36	1.33	.70	
Male	-.04	.53	.94	
Free/Reduced Lunch	-6.83	22.91	.00	
Special Education	-1.87	.79	.15	*
Limited English Proficiency	-.42	1.12	.64	
CTE Credit Ratio	2.60	7.23	14.30	
Constant	8.83	23.00	6827.05	

Note. All coefficients rounded to two digits.
*p < .05.

Table B8

Logistic regression predicting attending a four-year college, AHS site, 11th-grade cohort, senior survey respondents

	AHS and C-AHS			
	Cox & Snell R^2 = .049 *Nagelkerke R^2 = .067* N *for model = 161* *Test of model = 8.13*			
Variable	*B*	*SE B*	*Exp(B)*	
Experiment	.35	.41	1.42	
Latino	-.41	.61	.66	
Male	-.40	.34	.67	
Free/Reduced Lunch	-.61	.63	.54	
Special Education	-.13	.72	.88	
Limited English Proficiency	-.16	.50	.85	
CTE Credit Ratio	-8.20	5.42	.00	
Constant	2.04	.73	7.67	**

Note. All coefficients rounded to two digits.
**p < .01.

Table B9
Logistic regression predicting attending a two-year college, AHS site, 11th-grade cohort, senior survey respondents

	AHS and C-AHS Cox & Snell R^2 = .072 Nagelkerke R^2 = .099 N *for model = 161* *Test of model = 12.01*			
Variable	*B*	*SE B*	*Exp(B)*	
Experiment	.08	.42	1.09	
Latino	.14	.62	1.15	
Male	.66	.36	1.93	
Free/Reduced Lunch	1.43	.80	4.19	
Special Education	-.06	.76	.95	
Limited English Proficiency	.01	.51	1.01	
CTE Credit Ratio	8.65	5.65	5727.48	
Constant	-3.05	.90	.05	**

Note. All coefficients rounded to two digits.
$^{**}p < .01$.

Table B10

Response rates for senior survey, PHS site, 11th-grade cohort

	12th grade in 2002	*With Survey*		*Analytic Sample*	
School	N	N	%	N	%
PHS	330	200	61	198	60
C-PHS	209	174	83	174	83

Table B11

Logistic regression predicting plans for after high school, PHS site, 11th-grade cohort, senior survey respondents

	PHS and C-PHS			
	Cox & Snell R^2 = .083 *Nagelkerke R^2 = .126* N *for model = 370* *Test of model = 31.90***			
Variable	*B*	*SE B*	*Exp(B)*	
Experiment	.62	.31	1.85	*
Asian	4.47	9.86	87.08	
African American	.23	1.09	1.26	
Latino	-.54	.34	.58	
Other	-1.90	1.49	.15	
Male	-.43	.27	.65	
Free/Reduced Lunch	-.05	.32	.95	
Special Education	-.32	.61	.73	
Limited English Proficiency	-.74	.38	.48	
CTE Credit Ratio	.15	1.60	1.16	
Graduation	.93	.58	2.53	
Constant	.74	.73	2.09	

Note. All coefficients rounded to two digits.
*$p < .05$.

Table B12

Logistic regression predicting employment, PHS site, 11th-grade cohort, senior survey respondents

	PHS and C-PHS			
	Cox & Snell R^2 = .055 *Nagelkerke R^2 = .074* N *for model = 359* *Test of model = 20.21**			
Variable	*B*	*SE B*	*Exp(B)*	
Experiment	.60	.26	1.82	*
Asian	.95	.95	2.58	
African American	.56	.68	1.76	
Latino	.01	.29	1.01	
Other	-5.20	9.34	.01	
Male	-.33	.24	.72	
Free/Reduced Lunch	-.18	.29	.84	
Special Education	.47	.61	1.61	
Limited English Proficiency	-.36	.38	.70	
CTE Credit Ratio	2.34	1.37	10.37	
Graduation	-.15	.57	.86	
Constant	-.75	.68	.47	

Note. All coefficients rounded to two digits.
*$p < .05$.

Table B13

Logistic regression predicting full-time employment, PHS site, 11th-grade cohort, senior survey respondents

	PHS and C-PHS		
	Cox & Snell R^2 = .161 *Nagelkerke R^2 = .229* N *for model = 125* *Test of model = 21.99**		
Variable	*B*	*SE B*	*Exp(B)*
Experiment	.07	.52	1.07
Asian	-9.70	33.23	.00
African American	-.01	.96	.99
Latino	.51	.55	1.67
Male	.81	.50	2.26
Free/Reduced Lunch	.85	.63	2.35
Special Education	6.28	28.34	536.16
Limited English Proficiency	1.29	1.30	3.63
CTE Credit Ratio	1.16	2.73	3.18
Graduation	1.80	1.18	6.05
Constant	-1.88	1.38	.15

Note. All coefficients rounded to two digits.

Table B14
Logistic regression predicting acceptance into the military, PHS site, 11th-grade cohort, senior survey respondents

	PHS and C-PHS Cox & Snell R^2 = .054 Nagelkerke R^2 = .121 N for model = 357 Test of model = 19.75*			
Variable	*B*	*SE B*	*Exp(B)*	
Experiment	.52	.47	1.69	
Asian	-4.28	16.32	.01	
African American	.48	1.12	1.61	
Latino	1.09	.50	2.96	*
Other	10.09	36.66	23974.31	
Male	.83	.43	2.28	
Free/Reduced Lunch	-.77	.52	.46	
Special Education	.54	1.18	1.71	
Limited English Proficiency	-1.28	.86	.28	
CTE Credit Ratio	.82	2.29	2.27	
Graduation	-.28	.89	.76	
Constant	-3.27	1.18	.04	**

Note. All coefficients rounded to two digits.
*$p < .05$. **$p < .01$.

Table B15
Logistic regression predicting college acceptance, PHS site, 11th-grade cohort, senior survey respondents

	PHS and C-PHS			
	Cox & Snell R^2 = .142 Nagelkerke R^2 = .191 N *for model = 355* *Test of model = 54.26****			
Variable	*B*	*SE B*	*Exp(B)*	
Experiment	.41	.27	1.51	
Asian	.48	1.15	1.62	
African American	.45	.82	1.56	
Latino	-.66	.30	.52	*
Other	-6.08	9.54	.00	
Male	-.59	.24	.56	*
Free/Reduced Lunch	.19	.30	1.21	
Special Education	-.65	.67	.52	
Limited English Proficiency	-.65	.38	.52	
CTE Credit Ratio	-2.13	1.43	.12	
Graduation	2.79	1.08	16.28	**
Constant	-1.57	1.13	.21	

Note. All coefficients rounded to two digits.
*$p < .05$. **$p < .01$.

Table B16

Logistic regression predicting full-time college attendance, PHS site, 11th-grade cohort, senior survey respondents

	PHS and C-PHS			
	Cox & Snell R^2 = .084 *Nagelkerke R^2 = .186* N *for model = 201* *Test of model = 17.72*			
Variable	*B*	*SE B*	*Exp(B)*	
Experiment	-.35	.64	.70	
Asian	4.53	29.61	92.90	
African American	-.58	1.18	.56	
Latino	-.90	.71	.41	
Male	.44	.61	1.56	
Free/Reduced Lunch	.28	.73	1.33	
Special Education	-3.35	1.36	.04	*
Limited English Proficiency	-.41	.87	.67	
CTE Credit Ratio	-8.49	3.17	.00	**
Graduation	-7.32	60.44	.00	
Constant	11.71	60.45	122331.95	

Note. All coefficients rounded to two digits.
*$p < .05$. **$p < .01$.

Table B17

Logistic regression predicting attending a four-year college, PHS site, 11th-grade cohort, senior survey respondents

	PHS and C-PHS			
	Cox & Snell R^2 = .188 *Nagelkerke R^2 = .251* N *for model = 204* *Test of model = 42.46****			
Variable	*B*	*SE B*	*Exp(B)*	
Experiment	-.31	.36	.74	
Asian	.48	1.24	1.62	
African American	-.53	.87	.59	
Latino	-.64	.42	.53	
Male	.32	.33	1.38	
Free/Reduced Lunch	.19	.45	1.21	
Special Education	-7.98	18.07	.00	
Limited English Proficiency	.15	.62	1.16	
CTE Credit Ratio	-9.72	2.17	.00	***
Graduation	4.84	36.66	126.10	
Constant	-3.35	36.67	.04	

Note. All coefficients rounded to two digits.
****p* < .001.

Table B18

Logistic regression predicting attending a two-year college, PHS site, 11th-grade cohort, senior survey respondents

	PHS and C-PHS			
	Cox & Snell R^2 = .134 *Nagelkerke R^2 = .178* N *for model = 204* *Test of model = 29.25****			
Variable	*B*	*SE B*	*Exp(B)*	
Experiment	.71	.34	2.03	*
Asian	-.41	1.21	.67	
African American	.91	.86	2.48	
Latino	.66	.40	1.93	
Male	-.39	.32	.68	
Free/Reduced Lunch	-.23	.43	.79	
Special Education	8.06	18.17	3147.97	
Limited English Proficiency	.17	.60	1.18	
CTE Credit Ratio	4.89	1.88	132.44	**
Graduation	8.39	36.66	4387.97	
Constant	-9.67	36.67	.00	

Note. All coefficients rounded to two digits.
*$p < .05$. **$p < .01$.

Table B19

Logistic regression predicting overall remediation, PHS site, 11th-grade cohort, attended CC and graduated from high school

	PHS and C-PHS *Cox & Snell R^2 = .130* *Nagelkerke R^2 = .186* N *for model = 148* *Test of model = 20.61**			
Variable	*B*	SE B	*Exp(B)*	
Experiment	-.75	.54	.47	
Male	.10	.41	1.11	
Asian	.27	1.26	1.31	
African American	1.11	1.16	3.04	
Latino	.71	.56	2.03	
Other	16.63	104.68	16612612.78	
Free/Reduced Lunch	.17	.57	1.19	
Special Education	-7.87	32.10	.00	
Limited English Proficiency	14.30	45.38	1624982.38	
CTE Credit Ratio	-2.47	2.45	.08	
Constant	1.47	.62	4.35	*

Note. All coefficients rounded to two digits.
*p < .05.

Table B20

Logistic regression predicting mathematics remediation, PHS site, 11th-grade cohort, attended CC and graduated from high school

	PHS and C-PHS			
	Cox & Snell R^2 = .161 *Nagelkerke R^2 = .220* N *for model = 148* *Test of model = 26.05***			
Variable	*B*	*SE B*	*Exp(B)*	
Experiment	-.93	.50	.40	
Male	.22	.40	1.24	
Asian	.50	1.27	1.65	
African American	1.50	1.16	4.49	
Latino	.18	.52	1.20	
Other	-1.93	104.74	.15	
Free/Reduced Lunch	.49	.53	1.63	
Special Education	-7.44	32.32	.00	
Limited English Proficiency	14.18	45.65	1433674.80	
CTE Credit Ratio	-4.60	2.42	.01	
Constant	1.61	.59	5.00	**

Note. All coefficients rounded to two digits.
**p < .01.

Table B21

Logistic regression predicting reading remediation, PHS site, 11th-grade cohort, attended CC and graduated from high school

	PHS and C-PHS			
	Cox & Snell R^2 = .182 *Nagelkerke R^2 = .314* N *for model = 148* *Test of model = 29.69***			
Variable	*B*	*SE B*	*Exp(B)*	
Experiment	-1.88	.58	.15	*
Male	-.24	.56	.79	
Asian	-5.08	34.77	.01	
African American	-5.05	27.00	.01	
Latino	1.00	.63	2.71	
Other	-5.39	60.46	.01	
Free/Reduced Lunch	-.14	.65	.87	
Special Education	.14	1.63	1.16	
Limited English Proficiency	1.71	1.09	5.54	
CTE Credit Ratio	-1.39	3.73	.25	
Constant	-.93	.75	.40	

Note. All coefficients rounded to two digits.
*$p < .05$.

Table B22

Logistic regression predicting English remediation, PHS site, 11th-grade cohort, attended CC and graduated from high school

	PHS and C-PHS			
	Cox & Snell R^2 = .247 *Nagelkerke R^2 = .334* N *for model = 148* *Test of model = 42.00****			
Variable	*B*	*SE B*	*Exp(B)*	
Experiment	-1.12	.47	.33	*
Male	.12	.41	1.12	
Asian	-7.78	57.16	.00	
African American	.79	.98	2.21	
Latino	1.32	.51	3.72	*
Other	28.17	112.67	1717678962813.91	
Free/Reduced Lunch	-.30	.53	.74	
Special Education	-17.38	52.62	.00	
Limited English Proficiency	9.34	32.97	11391.33	
CTE Credit Ratio	4.74	2.60	114.35	
Constant	-1.00	.58	.37	

Note. All coefficients rounded to two digits.
*$p < .05$.

Table B23

Response rates for senior survey, VHS site, 11th-grade cohort

	12th grade in 2002	*With Survey*		*Analytic Sample*	
School	N	N	%	N	%
VHS	197	166	84	166	84
C-VHS	174	133	67	133	67

Table B24

Logistic regression predicting plans for after high school, VHS site, 11th-grade cohort, senior survey respondents

	VHS and C-VHS			
	Cox & Snell R^2 = .061 *Nagelkerke R^2 = .192* N *for model = 299* *Test of model = 18.68**			
Variable	*B*	*SE B*	*Exp(B)*	
Experiment	-1.17	1.17	.31	
Asian	-1.85	1.69	.16	
African American	-.95	1.13	.37	
Latino	-.39	1.16	.68	
Male	-.23	.60	.79	
Free/Reduced Lunch	-.03	.85	.97	
Special Education	-.94	.67	.39	
Limited English Proficiency	-3.32	.94	.04	***
CTE Credit Ratio	3.30	5.13	27.05	
Graduation	-.65	1.26	.52	
Constant	4.86	1.83	129.51	**

Note. All coefficients rounded to two digits.
**$p < .01$. ***$p < .001$.

Table B25

Logistic regression predicting employment, VHS site, 11th-grade cohort, senior survey respondents

	VHS and C-VHS			
	Cox & Snell $R^2 = .119$ Nagelkerke $R^2 = .160$ N *for model = 284* *Test of model = 36.01****			
Variable	*B*	*SE B*	*Exp(B)*	
Experiment	1.25	.57	3.48	*
Asian	.86	1.17	2.37	
African American	-.91	.38	.40	*
Latino	-.28	.39	.76	
Male	-.51	.27	.60	
Free/Reduced Lunch	.09	.36	1.10	
Special Education	-.22	.34	.80	
Limited English Proficiency	-1.95	.92	.14	*
CTE Credit Ratio	-1.34	2.58	.26	
Graduation	-1.03	.60	.36	
Constant	1.64	.82	5.13	*

Note. All coefficients rounded to two digits.
*$p < .05$.

Table B26

Logistic regression predicting full-time employment, VHS site, 11th-grade cohort, senior survey respondents

	VHS and C-VHS Cox & Snell $R^2 = .082$ Nagelkerke $R^2 = .115$ N *for model = 153* *Test of model = 13.07*			
Variable	*B*	*SE B*	*Exp(B)*	
Experiment	-1.76	.97	.17	
Asian	-1.37	1.22	.26	
African American	-.59	.49	.55	
Latino	-.75	.48	.47	
Male	.85	.38	2.33	*
Free/Reduced Lunch	-.04	.46	.96	
Special Education	.00	.52	1.00	
Limited English Proficiency	-5.17	22.26	.01	
CTE Credit Ratio	5.64	4.34	281.92	
Graduation	.95	.90	2.57	
Constant	-1.85	1.21	.16	

Note. All coefficients rounded to two digits.
*$p < .05$.

Table B27
Logistic regression predicting acceptance into the military, VHS site, 11th-grade cohort, senior survey respondents

	VHS and C-VHS			
	Cox & Snell R^2 = .075 *Nagelkerke R^2 = .180* N *for model = 276* *Test of model = 21.46**			
Variable	*B*	*SE B*	*Exp(B)*	
Experiment	.70	1.02	2.00	
Asian	-6.72	34.95	.00	
African American	-.46	.57	.63	
Latino	-1.70	.69	.19	*
Male	1.72	.56	5.58	**
Free/Reduced Lunch	.51	.65	1.67	
Special Education	.05	.61	1.05	
Limited English Proficiency	-5.25	38.09	.01	
CTE Credit Ratio	-5.55	4.24	.00	
Graduation	.28	1.10	1.32	
Constant	-2.13	1.41	.12	

Note. All coefficients rounded to two digits.
*$p < .05$. **$p < .01$.

Table B28

Logistic regression predicting college acceptance, VHS site, 11th-grade cohort, senior survey respondents

	VHS and C-VHS			
	Cox & Snell R^2 = .225 *Nagelkerke R^2 = .301* N *for model = 282* *Test of model = 71.97****			
Variable	*B*	*SE B*	*Exp(B)*	
Experiment	-2.10	.62	.12	**
Asian	-1.49	1.13	.26	
African American	-.59	.40	.55	
Latino	.27	.40	1.31	
Male	-1.43	.29	.24	***
Free/Reduced Lunch	.50	.39	1.65	
Special Education	-.48	.36	.62	
Limited English Proficiency	-.22	.94	.81	
CTE Credit Ratio	2.37	2.74	10.73	
Graduation	.83	.58	2.29	
Constant	.77	.81	2.15	

Note. All coefficients rounded to two digits.
**p < .01. ***p < .001.

Table B29
Logistic regression predicting full-time college attendance, VHS site, 11th-grade cohort, senior survey respondents

	VHS and C-VHS			
	Cox & Snell R^2 = .112 *Nagelkerke R^2 = .247* N *for model = 145* *Test of model = 17.21*			
Variable	*B*	*SE B*	*Exp(B)*	
Experiment	-.56	1.52	.57	
Asian	5.44	42.63	230.24	
African American	-.68	.91	.51	
Latino	.41	.90	1.51	
Male	-.41	.74	.67	
Free/Reduced Lunch	.80	.95	2.22	
Special Education	-1.53	.83	.22	
Limited English Proficiency	6.34	60.44	565.27	
CTE Credit Ratio	-8.81	7.16	.00	
Graduation	.58	1.28	1.79	
Constant	4.92	2.07	136.26	*

Note. All coefficients rounded to two digits.
*$p < .05$.

Table B30
Logistic regression predicting attending a four-year college, VHS site, 11th-grade cohort, senior survey respondents

	VHS and C-VHS			
	Cox & Snell $R^2 = .302$ Nagelkerke $R^2 = .408$ N for model = 150 Test of model = 53.85***			
Variable	*B*	*SE B*	*Exp(B)*	
Experiment	-2.78	.95	.06	**
Asian	4.93	15.74	138.36	
African American	-.78	.57	.46	
Latino	-.80	.59	.45	
Male	1.42	.51	4.13	**
Free/Reduced Lunch	-.96	.65	.38	
Special Education	-1.68	.77	.19	*
Limited English Proficiency	-.71	1.56	.49	
CTE Credit Ratio	2.17	3.72	8.76	
Graduation	1.01	1.10	2.74	
Constant	-.41	1.29	.67	

Note. All coefficients rounded to two digits.
*$p < .05$. **$p < .01$.

Table B31

Logistic regression predicting attending a two-year college, VHS site, 11th-grade cohort, senior survey respondents

	VHS and C-VHS			
	Cox & Snell R^2 = .299 *Nagelkerke R^2 = .404* N *for model = 150* *Test of model = 53.38****			
Variable	*B*	*SE B*	*Exp(B)*	
Experiment	2.79	.95	16.29	**
Asian	-4.77	15.74	.01	
African American	.94	.57	2.56	
Latino	1.00	.58	2.73	
Male	-1.52	.51	.22	**
Free/Reduced Lunch	.68	.61	1.97	
Special Education	1.72	.78	5.57	*
Limited English Proficiency	.72	1.56	2.05	
CTE Credit Ratio	-2.46	3.73	.09	
Graduation	-1.08	1.11	.34	
Constant	.40	1.29	1.49	

Note. All coefficients rounded to two digits.
**p* < .05. ***p* < .01.

Table B32

Logistic regression predicting overall remediation, VHS site, 11th-grade cohort, attended VCC and graduated from high school

	VHS and C-VHS		
	Cox & Snell R^2 = .057 Nagelkerke R^2 = .279 N *for model* = 82 *Test of model* = 4.83		
Variable	*B*	*SE B*	*Exp(B)*
Experiment	3.32	5.18	27.75
Male	-.24	1.62	.79
African American	1.39	1.57	4.00
Latino	9.64	71.38	15366.80
Free/Reduced Lunch	7.89	108.28	2665.14
Special Education	8.09	107.98	3258.04
Limited English Proficiency	.03	296.96	1.03
CTE Credit Ratio	-14.82	23.75	.00
Constant	4.50	4.53	89.69

Note. All coefficients rounded to two digits.

Table B33

Logistic regression predicting mathematics remediation, VHS site, 11th-grade cohort, attended VCC and graduated from high school

	VHS and C-VHS		
	Cox & Snell R^2 = .080 Nagelkerke R^2 = .294 N *for model* = 81 *Test of model* = 6.75		
Variable	*B*	*SE B*	*Exp(B)*
Experiment	2.53	4.16	12.50
Male	.75	1.41	2.11
African American	.74	1.43	2.09
Latino	9.67	71.56	15827.86
Free/Reduced Lunch	8.60	109.14	5421.25
Special Education	8.10	111.68	3297.58
Limited English Proficiency	-1.10	287.33	.33
CTE Credit Ratio	-15.77	19.51	.00
Constant	4.70	3.98	110.24

Note. All coefficients rounded to two digits.

Table B34

Logistic regression predicting reading remediation, VHS site, 11th-grade cohort, attended VCC and graduated from high school

	VHS and C-VHS		
	Cox & Snell R^2 = .104 *Nagelkerke R^2 = .140* N *for model = 82* *Test of model = 8.98*		
Variable	*B*	*SE B*	*Exp(B)*
Experiment	-.40	1.08	.67
Male	-.79	.50	.45
African American	.76	.76	2.14
Latino	1.00	.79	2.71
Free/Reduced Lunch	-.37	.63	.69
Special Education	1.25	.89	3.49
Limited English Proficiency	6.42	23.89	614.44
CTE Credit Ratio	2.05	5.09	7.74
Constant	-.53	1.13	.59

Note. All coefficients rounded to two digits.

Table B35

Logistic regression predicting English remediation, VHS site, 11th-grade cohort, attended VCC and graduated from high school

	VHS and C-VHS			
	Cox & Snell R^2 = .108 *Nagelkerke R^2 = .163* N *for model = 82* *Test of model = 9.33*			
Variable	*B*	*SE B*	*Exp(B)*	
Experiment	.01	1.35	1.01	
Male	-.09	.59	.91	
African American	1.37	.81	3.92	
Latino	1.83	.86	6.25	*
Free/Reduced Lunch	-.30	.71	.74	
Special Education	.88	1.19	2.41	
Limited English Proficiency	4.98	25.65	145.15	
CTE Credit Ratio	-3.13	6.37	.04	
Constant	.68	1.36	1.98	

Note. All coefficients rounded to two digits.
*$p < .05$.

APPENDIX C
CHAPTER 4 SUPPLEMENTAL ANALYSES

Table C1

Student attention rates, AHS, mathematics classes and other classes

	Math Classes			*Other Academic Classes*				*CTE Classes*				*All Non-Math Classes*		
Student Attention	N *Obs*	N *Int*	*Mean (SD)*	N *Obs*	N *Int*	*Mean (SD)*		N *Obs*	N *Int*	*Mean (SD)*		N *Obs*	N *Int*	*Mean (SD)*
Pct of obs with 100% attention	4	36	0.86 (0.21)	13	109	0.63 (0.28)		8	66	0.34 (0.24)	**	27	216	0.56 (0.30)
Pct of obs with 80% attention	4	36	0.03 (0.06)	13	109	0.23 (0.16)	*	8	66	0.26 (0.34)		27	216	0.22 (0.22)
Pct of obs with 60% attention	4	36	0.06 (0.06)	13	109	0.05 (0.08)		8	66	0.26 (0.31)		27	216	0.13 (0.20)
Pct of obs with 40% attention	4	36	0.03 (0.06)	13	109	0.07 (0.12)		8	66	0.04 (0.08)		27	216	0.05 (0.10)
Pct of obs with 20% attention	4	36	0.03 (0.06)	13	109	0.02 (0.04)		8	66	0.09 (0.14)		27	216	0.05 (0.10)
Overall mean			93.33 (10.58)			87.84 (12.85)				74.44 (8.44)	*			83.51 (13.23)

Note. Obs = Observations. Int = Intervals.

*$p < .05$. **$p < .01$.

Table C2

Student attention rates, AHS, CTE classes and other classes

	CTE Classes			Academic Classes				All Non-CTE Classes			
Student Attention	N *Obs*	N *Int*	*Mean (SD)*	N *Obs*	N *Int*	*Mean (SD)*		N *Obs*	N *Int*	*Mean (SD)*	
Pct of obs with 100% attention	8	66	0.34 (0.24)	17	145	0.69 (0.27)	**	23	196	0.68 (0.28)	**
Pct of obs with 80% attention	8	66	0.26 (0.34)	17	145	0.19 (0.17)		23	196	0.17 (0.16)	
Pct of obs with 60% attention	8	66	0.26 (0.31)	17	145	0.05 (0.07)		23	196	0.07 (0.09)	
Pct of obs with 40% attention	8	66	0.04 (0.08)	17	145	0.06 (0.11)		23	196	0.05 (0.10)	
Pct of obs with 20% attention	8	66	0.09 (0.14)	17	145	0.02 (0.05)		23	196	0.03 (0.07)	
Overall mean			74.44 (8.44)			89.13 (12.27)	**			88.37 (12.74)	**

Note. Pct of obs = Percent of observations. Obs = Observations. Int = Intervals.
**$p < .01$.

Table C3

ACC background information, Fall 2002

	Total	
Demographics	N	%
Number of part-time students	20,000	69
Number of full-time students	9,000	31
Total number of students	29,000	--
Male	13,000	45
Female	16,000	55
Median age	N/A	--
African American	1,600	6
Asian	2,500	9
Latino	4,600	16
White	14,800	51
Other	5,900	20
Number of full-time faculty	300	25
Number of adjunct faculty	900	75
Total number of faculty	1,200	--

Note. Numbers have been rounded to protect school anonymity, and may no longer add up to 100.

Table C4

Student attention rates, PHS, mathematics classes and other classes

Student Attention	*Math Classes* N Obs	N Int	*Mean (SD)*	*Other Academic Classes* N Obs	N Int	*Mean (SD)*		*CTE Classes* N Obs	N Int	*Mean (SD)*		*All Non-Math Classes* N Obs	N Int	*Mean (SD)*	
Pct of obs with 100% attention	5	41	0.15 (0.27)	11	83	0.48 (0.29)	*	13	105	0.56 (0.35)	*	26	202	0.50 (0.33)	*
Pct of obs with 80% attention	5	41	0.38 (0.29)	11	83	0.28 (0.18)		13	105	0.30 (0.35)		26	202	0.29 (0.27)	
Pct of obs with 60% attention	5	41	0.23 (0.11)	11	83	0.08 (0.12)	*	13	105	0.07 (0.11)	*	26	202	0.08 (0.11)	
Pct of obs with 40% attention	5	41	0.19 (0.28)	11	83	0.08 (0.13)		13	105	0.02 (0.06)		26	202	0.07 (0.15)	
Pct of obs with 20% attention	5	41	0.06 (0.08)	11	83	0.09 (0.17)		13	105	0.05 (0.10)		26	202	0.07 (0.13)	
Overall mean			67.39 (14.03)			79.97 (15.28)				85.82 (11.73)	*			81.53 (15.47)	

Note. Pct of obs = Percent of observations. Obs = Observations. Int = Intervals.
*p < .05.

Table C5

Student attention rates, PHS, CTE classes and academic classes

Student Attention	*CTE Classes* N Observations	N Intervals	*Mean (SD)*	*Academic Classes* N Observations	N Intervals	*Mean (SD)*	
Percent of observations with 100% attention	13	105	0.56 (0.35)	17	129	0.36 (0.32)	
Percent of observations with 80% attention	13	105	0.30 (0.35)	17	129	0.29 (0.21)	
Percent of observations with 60% attention	13	105	0.07 (0.11)	17	129	0.13 (0.13)	
Percent of observations with 40% attention	13	105	0.02 (0.06)	17	129	0.14 (0.22)	*
Percent of observations with 20% attention	13	105	0.05 (0.10)	17	129	0.08 (0.15)	
Overall mean			85.82 (11.73)			73.92 (17.48)	*

*p < .05.

Table C6
PCC background information, Fall 2002

	Total	
Demographics	N	%
Number of part-time students	2,500	37
Number of full-time students	4,200	63
Total number of students	6,700	--
Male	2,900	43
Female	3,700	55
Median age	30	--
African American	200	3
Asian	300	4
Latino	1,200	18
White	4,900	73
Other	10	0
Number of full-time faculty	100	25
Number of adjunct faculty	300	75
Total number of faculty	400	--

Note. Numbers have been rounded to protect school anonymity, and may no longer add up to 100.

Table C7
CCC background information, Fall 2004

	Total	
Demographics	N	%
Number of part-time students	3,000	45
Number of full-time students	3,700	55
Total number of students	6,700	--
Male	2,300	34
Female	4,400	66
Median age	25	--
African American	200	3
Asian	70	1
Latino	200	30
White	4,300	64
Other	300	5
Number of full-time faculty	N/A	--
Number of adjunct faculty	N/A	--
Total number of faculty	N/A	--

Note. Numbers have been rounded to protect school anonymity, and may no longer add up to 100. Fall 2004 was the most recent year for which demographic information was available.

Table C8

Student attention rates, VHS, CTE classes and academic classes

	CTE Classes			Academic Classes		
Student Attention	N *Observations*	N *Intervals*	*Mean (SD)*	N *Observations*	N *Intervals*	*Mean (SD)*
Percent of observations with 100% attention	6	53	0.40 (0.35)	7	49	0.20 (0.27)
Percent of observations with 80% attention	6	53	0.28 (0.19)	7	49	0.26 (0.24)
Percent of observations with 60% attention	6	53	0.17 (0.16)	7	49	0.16 (0.17)
Percent of observations with 40% attention	6	53	0.02 (0.05)	7	49	0.22 (0.22)
Percent of observations with 20% attention	6	53	0.13 (0.20)	7	49	0.16 (0.15)
Overall mean			75.88 (16.77)			62.53 (13.53)

Table C9

VCC background information, Fall 2002

	Total	
Demographics	N	%
Number of part-time students	2,800	45
Number of full-time students	3,500	55
Total number of students	6,300	--
Male	2,900	46
Female	3,400	54
Median age	26	--
African American	750	12
Latino	800	13
Asian	180	3
White	4,450	71
Other	120	2
Number of full-time faculty	180	75
Number of adjunct faculty	60	25
Total number of faculty	240	--

Note. Numbers have been rounded to protect school anonymity, and may no longer add up to 100.

APPENDIX D
POSTHOC ANALYSES OF AHS COMPARISON SUBGROUPS

Students from Academy Middle School (AMS) could attend AHS, the comparison school, or another high school. Because students had to apply to attend AHS, we were able to construct subgroups within the comparison sample that approximated a random design. Instead of one comparison group like we have for the other study sites, the AHS site provided four comparison subgroups for the high school engagement and achievement analyses. This appendix provides outcomes for these comparison subgroups.

In the main body of the report, "C-AHS" referred to a specific subgroup of students from that school. In this appendix, we continue that usage and refer to the entire school as "C-AHS-total." We introduce the comparison school subgroups starting with the one most like AHS and continue in descending order, ending with C-AHS-notAMS, the subgroup with no students from AMS and therefore least like AHS:

- C-AHS consists of students who attended AMS and applied to AHS but were not selected. This comparison group was presented in the main body of the report. Its results are repeated in the tables in this appendix for ease of comparison.
- C-AHS-notapplied consists of students who attended AMS but did not apply to AHS.
- C-AHS-total consists of all students from the 9th-grade cohort at the comparison high school (i.e., C-AHS, C-AHS-notapplied, and C-AHS-notAMS combined).
- C-AHS-notAMS consists of students who never attended AMS.

Many of the outcomes reported here reflect this descending order of distance from AMS, suggesting a strong relationship between middle school attendance and high school performance. Specifically, students who attended AMS and therefore had the Urban Learning Centers reform experience outperformed students who did not, regardless of high school attended.

The presentation of findings in this appendix will mirror the main body of the report: The 9th-grade cohort will provide the high school engagement and achievement results, and the 11th-grade cohort will provide the postsecondary transition results. Table 5 of the main body of the report (see page 30) provides a glossary of the sample names and their referents.

The background characteristics of the 9th-grade subgroups are shown in Table D1. We compared the groups for significant differences in background characteristics. The C-AHS subgroup had fewer African American students, more Latino students, and more Limited English Proficient (LEP) students than the AHS group.

Table D1
Ninth-grade cohort (2004) background characteristics

School	N	*Female*	*Male*		*Asian*	*Black*		*Latino*		*White*	*Other*	*Special Education*		*LEP Status*		*Free/Reduced Lunch Status*	
		%	%		%	%		%		%	%	%		%		%	
AHS	186	59.1	40.9		0.5	22.0		76.3		0.5	0.5	7.5		49.5		85.5	
C-AHS	95	49.5	50.5		0.0	5.3	*	94.7	*	0.0	0.0	5.3		85.3	*	86.3	
C-AHS-notapplied	184	44.0	56.0	*	0.0	28.8		71.2		0.0	0.0	24.5	*	64.1	*	89.7	
C-AHS-total	1,111	45.1	54.9	*	0.2	23.2		76.3		0.1	0.2	27.9	*	70.3	*	77.4	*
C-AHS-notAMS	832	44.8	55.2	*	0.2	24.0		75.4		0.1		31.3	*	70.0	*	73.7	

Note. Significance level indicates difference between study and comparison schools.
*$p < .05$.

With respect to the other comparisons, all three of the subgroups had more male students, more LEP students, and more special education students than AHS. The C-AHS-total group (i.e., the entire school) and the C-AHS-notAMS group (i.e, students who never attended AMS) showed significantly fewer students in the free/reduced price lunch program than AHS. Finally, Table D1 shows that C-AHS students were indeed the closest match for AHS students among the subgroups, and that the similarities between the groups diminish with the extent of contact with AMS.

Student Engagement: Attendance and Dropout

We found that AHS students attended school at a significantly higher rate than any of the comparison groups. As shown in Table D2, for students who left school before the fourth year of the study, as well as for those who were in the study for the entire four years, AHS students attended more often than students at the comparison school. The exception was during the fourth (senior) year, when attendance rates were not significantly different among the different groups of students. This may indicate that there is little difference in school engagement among students who persist through four years of high school.

Table D2

Mean attendance for 9th-grade cohort, by number of years students were in study

Years in Study	*School*	N *at Start*	N *Who Left*	*Mean Attendance 00-01*		*Mean Attendance 01-02*		*Mean Attendance 02-03*		*Mean Attendance 03-04*
Year 1	AHS	186	21	80.69						
	C-AHS	95	16	79.97						
	C-AHS-notapplied	184	37	68.89	*					
	C-AHS-total	1,111	382	56.07	*					
	C-AHS-notAMS	832	329	53.47	*					
Year 2	AHS	165	18	85.31		79.63				
	C-AHS	79	14	74.88	*	71.43				
	C-AHS-notapplied	147	39	78.26	*	69.52	*			
	C-AHS-total	729	181	65.81	*	69.16	*			
	C-AHS-notAMS	503	128	61.02	*	68.80	*			
Year 3	AHS	147	17	81.54		82.71		72.75		
	C-AHS	65	16	82.67		77.47	*	66.49		
	C-AHS-notapplied	108	41	75.66	*	72.34	*	70.09		
	C-AHS-total	548	199	73.15	*	74.74	*	72.41		
	C-AHS-notAMS	375	142	71.36	*	75.13	*	73.74		
Year 4	AHS	130	130	87.35		86.71		85.62		80.66
	C-AHS	49	49	82.89	*	80.28	*	80.90	*	80.52
	C-AHS-notapplied	67	67	85.46	*	83.83	*	82.63	*	82.45
	C-AHS-total	349	349	80.29	*	81.93	*	81.17	*	80.17
	C-AHS-notAMS	233	233	78.26	*	81.73	*	80.82	*	79.44

*$p < .05$.

As a separate measure of student engagement, the models presented in Table D3 predict the hazard or risk of dropping out, given certain student characteristics. Unfortunately, district data did not include a dropout code, only students whose location was unknown. We have counted unknowns at AHS and the comparison school as dropouts.

AHS students and C-AHS students had statistically similar odds of dropping out (see Table D3). However, the table also shows that the odds of an AHS student dropping out were about half that of C-AHS-total students or C-AHS-notapplied students. Finally, the odds that an AHS student would drop out of high school were only 37% that of C-AHS-notAMS students (i.e., students who had never attended AMS).

Table D3
Risk-hazard model with time-dependent covariate predicting unknown status

	C-AHS				*C-AHS-notapplied*				*C-AHS-total*				*C-AHS-notAMS*			
	Cox & Snell $R^2 = .077$ *Nagelkerke* $R^2 = .216$				*Cox & Snell* $R^2 = .131$ *Nagelkerke* $R^2 = .277$				*Cox & Snell* $R^2 = .174$ *Nagelkerke* $R^2 = .290$				*Cox & Snell* $R^2 = .192$ *Nagelkerke* $R^2 = .312$			
Variable	*B*	*SE B*	*Hazard Ratio*		*B*	*SE B*	*Hazard Ratio*		*B*	*SE B*	*Hazard Ratio*		*B*	*SE B*	*Hazard Ratio*	
Site (1 = Intervention)	0.19	0.40	1.21		-0.61	0.28	0.54	*	-0.78	0.22	0.46	***	-0.99	0.23	0.37	***
CTE Credit Ratio	-11.75	3.09	0.00	***	-10.82	2.29	0.00	***	-7.12	1.07	0.00	***	-6.05	1.16	0.00	***
Male	0.23	0.34	1.26		0.25	0.25	1.29		0.33	0.11	1.39	**	0.34	0.13	1.40	**
Latino	-0.07	0.46	0.93		0.43	0.38	1.53		0.06	0.21	1.06		0.13	0.23	1.14	
Special Education	-0.01	0.64	0.99		0.39	0.35	1.47		0.41	0.16	1.50	*	0.43	0.18	1.54	*
LEP	-0.72	0.39	0.49		-0.10	0.34	0.90		-0.19	0.19	0.83		-0.41	0.21	0.66	*
Free/Reduced Lunch	0.04	0.47	1.04		-0.22	0.37	0.80		-0.82	0.14	0.44	***	-0.82	0.15	0.44	***
8th-Grade Math Ach	-0.02	0.01	0.98	*	-0.02	0.01	0.98	**	-0.03	0.00	0.97	***	-0.03	0.01	0.97	***
Missing Ach Score	-0.78	0.80	0.46		-0.05	0.41	0.95		-0.16	0.18	0.85		-0.31	0.21	0.73	
Years								***				**				**
Years (1)	6.53	11.49	684.48		7.18	10.92	1313.88		7.29	4.26	1459.63		7.45	4.89	1714.74	
Years (2)	7.54	11.49	1872.64		7.67	10.92	2148.00		7.04	4.26	1139.29		7.09	4.89	1205.16	
Years (3)	8.29	11.49	3997.47		8.49	10.92	4866.48		7.59	4.26	1981.70		7.62	4.89	2037.98	

Note. N excludes transfers and ill/deceased students. District data did not include a dropout code, only students whose location is unknown. We have counted unknowns at this site as dropouts. All coefficients rounded to two digits.
LEP = Limited English Proficiency; Ach = Achievement.
$^*p < .05$. $^{**}p < .01$. $^{***}p < .001$.

In Table D3, the ratio of CTE courses taken to the total courses taken is strongly significant in each model. This indicates that regardless of high school attended, an increase in the ratio is associated with a meaningful decrease in the odds of dropping out. The very small hazard ratio for this variable—so small as to round to zero in each comparison—indicates that an increase in the number of CTE credits earned relative to academic credits was associated with a very large reduction in the odds of dropping out. This relationship is consistent and significant across all comparison groups.

The regression models predicting dropout reflect the continuum described earlier, in which the C-AHS subgroup is most like the AHS students, followed by C-AHS-notapplied. The last two groups—the overall school and the subgroup of students who never attended AMS—have outcomes least like those of AHS students. In these latter two subgroup models, being male, participating in the free/reduced price lunch program, and receiving special education services were significant predictors of dropping out (see Table D3).

Student Achievement

Significantly fewer AHS students were promoted to the next grade in Years 1 and 2 of the study than were any of the comparison subgroup students. In Year 3, students were promoted from one grade to the next at similar rates at AHS and in all of the comparison groups (see Table D4). These results do not follow the continuum pattern noted above. One possible reason for this anomalous result might be that the coursework at the comparison school was easier, allowing more students to advance.

Table D4

Promotion status of students who remained in study by year staying in study, 9th-grade cohort

Year	*School*	N	*Percent in Next Grade*	
Year 1	AHS	156	73.9	
	C-AHS	79	100.0	*
	C-AHS-notapplied	145	98.6	*
	C-AHS-total	709	98.2	*
	C-AHS-notAMS	485	97.8	*
Year 2	AHS	138	86.4	
	C-AHS	65	100.0	*
	C-AHS-notapplied	106	99.1	*
	C-AHS-total	528	98.0	*
	C-AHS-notAMS	357	97.3	*
Year 3	AHS	121	93.8	
	C-AHS	49	100.0	
	C-AHS-notapplied	65	100.0	
	C-AHS-total	329	99.1	
	C-AHS-notAMS	121	98.7	

*$p < .05$.

Earning Math and Science Credits

AHS students earned significantly more math credits than any of the four comparison groups except for C-AHS-notapplied (see Table D5). AHS students earned significantly more science credits than students at the comparison school overall, but not more than any subgroup.

Table D5

Average mathematics and science credits, 9th-grade cohort

		Math Credits			*Science Credits*		
School	N	*Mean*	*SD*		*Mean*	*SD*	
AHS	130	3.00	1.17		2.63	0.80	
C-AHS	49	2.39	0.73	*	2.78	0.77	
C-AHS-notapplied	67	2.81	0.99		2.46	0.70	
C-AHS-total	349	2.62	0.95	*	2.52	0.81	*
C-AHS-notAMS	233	2.61	0.97	*	2.48	0.84	

*$p < .05$.

We examined the effect of subgroup and student background characteristics on earning credits in math and science. Tables D6 through D9 present the results from the separate regression analyses conducted on AHS and each of the subgroups. Since the *B* coefficient is the unit of analysis (in this case, credits earned), Tables D6 through D9 provide information on the differences in credits earned.

Table D6
Linear regression predicting mathematics and science credit attainment, AHS with C-AHS, 9th-grade cohort

	Algebra 1 or Higher Credits				High-Level Math Credits				Science Credits			
	Adjusted $R^2 = .590$				Adjusted $R^2 = .483$				Adjusted $R^2 = .588$			
Variable	*B*	*SE B*	*ß*		*B*	*SE B*	*ß*		*B*	*SE B*	*ß*	
Site (1 = Intervention)	0.04	0.13	0.02		0.40	0.09	0.21	***	-0.03	0.11	-0.01	
Male	-0.18	0.11	-0.06		-0.09	0.08	-0.05		-0.24	0.09	-0.10	**
Latino	-0.08	0.17	-0.02		-0.15	0.12	-0.07		0.13	0.14	0.04	
Free/Reduced Lunch	-0.07	0.16	-0.02		-0.18	0.11	-0.07		0.03	0.13	0.01	
Special Education	-0.49	0.24	-0.09	*	-0.33	0.17	-0.09		-0.53	0.20	-0.12	**
LEP	-0.02	0.14	-0.01		0.18	0.10	0.10		-0.08	0.11	-0.04	
Eighth-Grade Math	0.02	0.00	0.30	***	0.02	0.00	0.47	***	0.00	0.00	0.04	
Missing Achievement	0.64	0.29	0.10	*	0.36	0.21	0.09		-0.05	0.24	-0.01	
Years (1)	-2.25	0.17	-0.54	***	-0.53	0.12	-0.20	***	-2.22	0.14	-0.66	***
Years (2)	-1.75	0.18	-0.40	***	-0.59	0.13	-0.21	***	-1.67	0.15	-0.46	***
Years (3)	-1.23	0.18	-0.28	***	-0.44	0.13	-0.16	**	-1.03	0.15	-0.29	***

Note. $N = 1297$. All coefficients rounded to two digits. LEP = Limited English Proficiency.
*$p < .05$. **$p < .01$. ***$p < .001$.

Table D7

Linear regression predicting mathematics and science credit attainment, AHS with C-AHS-not-applied, 9th-grade cohort

	Algebra 1 or Higher Credits				High-Level Math Credits				Science Credits			
	Adjusted R^2 = .635				Adjusted R^2 = .482				Adjusted R^2 = .658			
Variable	*B*	*SE B*	*ß*		*B*	*SE B*	*ß*		*B*	*SE B*	*ß*	
Site (1 = Intervention)	-0.10	0.11	-0.03		0.20	0.07	0.12	**	0.17	0.09	0.07	
Male	-0.01	0.09	-0.01		-0.11	0.06	-0.07		-0.24	0.08	-0.10	**
Latino	-0.16	0.13	-0.05		-0.07	0.09	-0.04		0.05	0.11	0.02	
Free/Reduced Lunch	0.01	0.14	0.00		-0.15	0.10	-0.06		0.08	0.11	0.02	
Special Education	-0.26	0.17	-0.07		-0.05	0.12	-0.02		-0.53	0.14	-0.16	***
LEP	0.04	0.12	0.01		0.09	0.08	0.05		-0.06	0.10	-0.03	
Eighth-Grade Math	0.02	0.00	0.31	***	0.02	0.00	0.52	***	0.00	0.00	0.05	
Missing Achievement	0.39	0.18	0.10	*	0.37	0.12	0.16	**	0.18	0.15	0.05	
Years (1)	-2.34	0.13	-0.60	***	-0.54	0.09	-0.24	***	-2.03	0.11	-0.61	***
Years (2)	-1.87	0.14	-0.48	***	-0.47	0.10	-0.21	***	-1.83	0.11	-0.55	***
Years (3)	-1.10	0.14	-0.28	***	-0.41	0.10	-0.18	***	-1.02	0.11	-0.31	***

Note. N = 370. All coefficients rounded to two digits. LEP = Limited English Proficiency.
*$p < .05$. **$p < .01$. ***$p < .001$.

Table D8

Linear regression predicting mathematics and science credit attainment, AHS with C-AHS-total, 9th-grade cohort

	Algebra 1 or Higher Credits				*High-Level Math Credits*				*Science Credits*			
	Adjusted R^2 = .679				*Adjusted R^2 = .419*				*Adjusted R^2 = .706*			
Variable	*B*	*SE B*	*ß*		*B*	*SE B*	*ß*		*B*	*SE B*	*ß*	
Site (1 = Intervention)	0.03	0.07	0.01		0.44	0.04	0.30	***	0.03	0.06	0.01	
Male	-0.08	0.04	-0.03		-0.03	0.02	-0.03		-0.15	0.04	-0.06	***
Latino	-0.01	0.07	0.00		-0.06	0.04	-0.05		0.10	0.07	0.03	
Free/Reduced Lunch	0.05	0.05	0.02		-0.04	0.03	-0.03		0.05	0.05	0.02	
Special Education	-0.19	0.07	-0.06	**	-0.02	0.04	-0.02		-0.19	0.06	-0.07	**
LEP	-0.02	0.07	-0.01		0.06	0.04	0.05		-0.08	0.06	-0.03	
Eighth-Grade Math	0.02	0.00	0.25	***	0.01	0.00	0.44	***	0.01	0.00	0.10	***
Missing Achievement	0.26	0.07	0.09	***	0.24	0.04	0.21	***	-0.07	0.06	-0.03	
Years (1)	-2.18	0.05	-0.78	***	-0.24	0.03	-0.21	***	-2.16	0.05	-0.81	***
Years (2)	-1.64	0.06	-0.46	***	-0.24	0.04	-0.16	***	-1.79	0.06	-0.52	***
Years (3)	-0.96	0.06	-0.28	***	-0.23	0.03	-0.16	***	-1.20	0.06	-0.36	***

Note. N = 1297. All coefficients rounded to two digits.
LEP = Limited English Proficiency.
** $p < .01$. *** $p < .001$.

Table D9

Linear regression predicting mathematics and science credit attainment, AHS with C-AHS-notAMS, 9th-grade cohort

	Algebra 1 or Higher Credits				*High-Level Math Credits*				*Science Credits*			
	Adjusted R^2 = .690				*Adjusted R^2 = .45*				*Adjusted R^2 = .712*			
Variable	*B*	*SE B*	*ß*		*B*	*SE B*	*ß*		*B*	*SE B*	*ß*	
Site (1 = Intervention)	0.00	0.07	0.00		0.42	0.04	0.29	***	0.02	0.07	0.01	
Male	-0.10	0.05	-0.04	*	-0.04	0.03	-0.04		-0.18	0.04	-0.07	***
Latino	0.01	0.08	0.00		-0.08	0.05	-0.06		0.11	0.07	0.04	
Free/Reduced Lunch	0.05	0.06	0.02		-0.03	0.03	-0.02		0.06	0.05	0.02	
Special Education	-0.22	0.07	-0.07	**	-0.03	0.04	-0.03		-0.22	0.07	-0.08	**
LEP	-0.03	0.08	-0.01		0.08	0.04	0.07		-0.12	0.07	-0.04	
Eighth-Grade Math	0.02	0.00	0.27	***	0.01	0.00	0.47	***	0.01	0.00	0.12	***
Missing Achievement	0.30	0.08	0.11	***	0.27	0.04	0.23	***	-0.05	0.07	-0.02	
Years (1)	-2.18	0.06	-0.78	***	-0.25	0.03	-0.21	***	-2.11	0.06	-0.81	***
Years (2)	-1.60	0.08	-0.42	***	-0.27	0.04	-0.17	***	-1.72	0.07	-0.49	***
Years (3)	-1.00	0.07	-0.27	***	-0.26	0.04	-0.17	***	-1.19	0.07	-0.35	***

Note. N = 1017. All coefficients rounded to two digits.
LEP = Limited English Proficiency.
* $p < .05$. ** $p < .01$. *** $p < .001$.

First, we found no difference between any of the subgroups on the likelihood of earning credits in Algebra 1 or higher. However, special education status was a negative predictor of credits earned in this category for students in C-AHS, C-AHS-total, and C-AHS-notAMS (see Tables D6, D8, and D9). This means that regardless of high school attended, being a special education student meant being less likely to complete Algebra 1 or higher math course.

Next, we found that AHS students were more likely than students from any of the comparison subgroups to take high-level math courses. AHS students were likely to earn 0.2 more high-level math credits than students from the C-AHS-notapplied subgroup (see Table D7) and approximately 0.4 more high-level math credits than students from the three other subgroups (see Tables D6, D8, and D9).

For both the Algebra 1 and higher and the high-level math categories, prior math achievement was a significant predictor of math credits earned. Regardless of high school attended, the higher a student's 8th grade math achievement score, the more likely he/she was to earn more math credits. However, the actual number of credits earned was small.

With respect to science, there were no significant differences in the credits earned by AHS students and students from any subgroup. However, in each subgroup comparison there were two predictors of science credits earned. Being male and being a special education student were each negative predictors of science credits earned in all comparisons: regardless of high school attended, males and special education students were less likely to complete science courses (see Tables D6, D7, D8, and D9).

CTE Outcomes

CTE Credits Earned

AHS students earned significantly more CTE credits by the end of four years of high school than all of the four comparison groups (see Table D10). When we controlled for background characteristics, we found that AHS students were more likely to earn more CTE credits—between 0.38 and 0.57 more credits in CTE—than their peers across all comparison subgroups (see Table D11). This was most likely due to the career academy courses at AHS. Every AHS student had to be in a career academy in Grades 10-12, and academy courses made up most of an AHS student's schedule after required courses.

Table D10
Average CTE credits

School	N	CTE Credits Mean	CTE Credits SD	
AHS	130	2.42	0.91	
C-AHS	49	1.61	1.00	*
C-AHS-notapplied	67	1.82	1.17	*
C-AHS-total	349	1.78	1.33	*
C-AHS-notAMS	233	1.81	1.43	*

*$p < .05$.

Table D11
Linear regression predicting CTE credit attainment, 9th-grade cohort

	C-AHS				*C-AHS-notapplied*				*C-AHS-total*				*C-AHS-notAMS*			
	Adjusted R^2 = .487				*Adjusted R^2 = . 475*				*Adjusted R^2 = . 445*				*Adjusted R^2 = . 467*			
Variable	*B*	*SE B*	*ß*		*B*	*SE B*	*ß*		*B*	*SE B*	*ß*		*B*	*SE B*	*ß*	
Site (1 = Intervention)	0.57	0.13	0.23	***	0.39	0.11	0.15	**	0.44	0.08	0.13	***	0.38	0.09	0.12	***
Male	0.00	0.11	0.00		0.02	0.10	0.01		0.13	0.05	0.05	*	0.12	0.06	0.05	*
Latino	-0.03	0.16	-0.01		0.02	0.14	0.01		0.00	0.09	0.00		-0.03	0.10	-0.01	
Free/Reduced Lunch	-0.04	0.15	-0.01		-0.09	0.15	-0.02		0.08	0.06	0.03		0.11	0.07	0.04	
Special Education	-0.17	0.23	-0.04		0.11	0.18	0.03		0.16	0.08	0.06	*	0.13	0.09	0.05	
LEP	0.13	0.13	0.05		0.09	0.13	0.04		-0.04	0.08	-0.02		-0.01	0.09	0.00	
8th-Grade Math Ach	0.00	0.00	0.09		0.00	0.00	0.05		0.00	0.00	0.03		0.00	0.00	0.06	
Missing Ach Score	-0.33	0.28	-0.06		-0.15	0.19	-0.04		-0.23	0.09	-0.09		-0.19	0.10	-0.07	*
Years (1)	-1.74	0.16	-0.49	***	-1.80	0.14	-0.52	***	-1.63	0.07	-0.62	*	-1.65	0.08	-0.63	***
Years (2)	-1.40	0.17	-0.37	***	-1.58	0.15	-0.45	***	-1.50	0.08	-0.45	*	-1.54	0.09	-0.43	***
Years (3)	-1.03	0.17	-0.28	***	-1.02	0.15	-0.30	***	-0.90	0.08	-0.28		-0.94	0.09	-0.27	***

Note. All coefficients rounded to two digits.
LEP = Limited English Proficiency. Ach = Achievement.
*$p < .05$. **$p < .01$. ***$p < .001$.

Graduation

Table D12 shows that AHS students had similar odds of graduating as their peers who had also attended AMS (i.e., the C-AHS and C-AHS-notapplied groups). This is indicated by the lack of statistical significance of the site variable. However, AHS students fared better than the students in C-AHS-total, and better than the C-AHS-notAMS subgroup. In these cases, the odds of graduating were between 64% and 96% greater for an AHS student, holding other demographic characteristics constant. These findings support the conclusion that there was a middle school effect: regardless of high school attended, AMS students were more likely to graduate from high school than students who did not attend AMS.

Table D12 also shows that participating in the free/reduced price lunch program was a positive predictor for graduation among the C-AHS-total subgroup: students in the free/reduced price lunch program were more than twice as likely to graduate. Conversely, in the C-AHS-notAMS group, the odds of such participants graduating were less than half the odds of those not receiving free/reduced price lunch. In the C-AHS-notAMS comparison group, LEP students were twice as likely to graduate than their non-LEP counterparts.

Table D12

Logistic regression predicting graduation, 9th-grade cohort

	C-AHS Cox & Snell R^2 = .138 Nagelkerke R^2 = .204 N = 226				*C-AHS-notapplied* Cox & Snell R^2 = .209 Nagelkerke R^2 = .286 N = 294				*C-AHS-total* Cox & Snell R^2 =.230 Nagelkerke R^2 = .308 N = 958				*C-AHS-notAMS* Cox & Snell R^2 = .258 Nagelkerke R^2 = .354 N = 756			
Variable	*B*	*SE B*	*ß*		*B*	*SE B*	*ß*		*B*	*SE B*	*ß*		*B*	*SE B*	*ß*	
Site (1 = Intervention)	-0.23	0.39	0.80		0.51	0.31	1.67		0.49	0.24	1.64	*	0.67	0.26	1.96	**
Male	-0.69	0.37	0.50		-0.60	0.29	0.55	*	-0.49	0.15	0.61	**	-0.50	0.17	0.61	**
Latino	0.03	0.51	1.03		-0.66	0.44	0.52		-0.17	0.28	0.84		-0.22	0.32	0.80	
Free/Reduced Lunch	0.43	0.70	1.54		-0.09	0.49	0.92		0.88	0.20	2.41	***	-0.87	0.28	0.42	**
Special Education	0.10	0.52	1.10		0.21	0.39	1.23		-0.74	0.24	0.48	**	0.33	0.28	1.39	
LEP	0.76	0.42	2.14		0.20	0.45	1.22		0.09	0.25	1.10		0.89	0.23	2.44	***
Eighth-Grade Math	0.04	0.01	1.04	***	0.04	0.01	1.04	***	0.04	0.01	1.04	***	0.04	0.01	1.04	***
Missing Achievement	0.55	0.86	1.73		-0.16	0.56	0.85		0.00	0.26	1.00		0.24	0.29	1.27	

Note. All coefficients rounded to two digits.
LEP = Limited English Proficiency.
**p* < .05. ***p* < .01. ****p* < .001.

Summary of Engagement and Achievement

Student engagement and achievement at AHS were generally quite high. Attendance at AHS was better than for any group at the comparison school. AHS students were less likely to drop out than all subgroups except C-AHS-applied. In terms of achievement, the same or fewer AHS students were promoted to the next grade as students from all the comparison subgroups. AHS students earned more math credits than all groups except C-AHS-notapplied. While there was no difference in the odds of a student from AHS or any comparison group earning credits in Algebra or higher, the odds of earning high-level math credits were higher at AHS. AHS students earned the same or more science credits than the comparison groups, and there was no difference in the likelihood of a student from any comparison group earning more science credits. In terms of CTE credit acquisition, students at AHS earned more CTE credits than any of their counterparts. Finally, AHS students were more likely to graduate than C-AHS-total students and C-AHS-notAMS students. There were no differences in the likelihood of graduating between AHS students and either C-AHS-applied or C-AHS-notapplied students. Together, these findings support the conclusion of a middle school effect: regardless of high school attended, AMS students had better high school outcomes than students who did not attend AMS.

Student Transition

For the postsecondary transition analyses, we used the 11th-grade cohort, which was made up of students in the 11th grade at the beginning of our study (for details, see the main body of the report). Unlike the 9th-grade cohort used for analyses of high school engagement and achievement, we were not able to distinguish between AMS applicants and nonapplicants to AHS in the 11th-grade cohort due to a lack of system records. Thus here we have three comparison subgroups instead of four, using the following nomenclature:

- C-AHS consists of students who attended AMS but either chose not to apply to AHS or applied but were not selected. This comparison group was presented in the main body of the report, and its results are repeated in the tables in this appendix for ease of comparison.
- C-AHS-total, which includes all students from the 11th-grade cohort at the comparison school (i.e., C-AHS and C-AHS-notAMS combined).
- C-AHS-notAMS consists of students who never attended AMS.

The background characteristics of the 11th-grade subgroups are shown in Table D13. We compared the subgroups for significant differences in background characteristics. All three subgroups of the comparison school had significantly more males, special education students, and LEP students than the AHS group. These differences in demographics as well as the small sample sizes at this site should be kept in mind during the following discussion.

Table D13
Eleventh-grade cohort (2002) background characteristics

		Female	*Male*		*Asian*	*Black*	*Latino*	*White*	*Other*	*Special Education*		*LEP Status*		*Free/Reduced Lunch Status*
School	N	*%*	*%*		*%*	*%*	*%*	*%*	*%*	*%*		*%*		*%*
AHS	109	64.2	35.8		0.0	21.1	78.0	0.0	0.0	5.5		54.1		86.2
C-AHS	154	50.6	49.4	*	0.0	24.0	76.0	0.0	0.0	19.5	*	70.8	*	88.3
C-AHS-total	571	50.4	49.6	*	0.2	18.7	80.9	0.0	0.2	18.0	*	76.7	*	84.6
C-AHS-notAMS	417	50.4	49.6	*	0.2	16.8	82.7	0.0	0.2	17.5	*	78.9	*	83.2

Note. Significance level indicates difference between intervention and comparison schools.
**p* < .05.

Post-High School Plans

From the 11th-grade cohort at each site, we constructed a sample consisting of students who were seniors in 2001-02 and who returned a senior survey to us (see Table D14 for senior survey response rates; see page 34 for a description of the analytic sample).

Table D14

Response rates for senior survey, 11th-grade cohort

	12th grade in 2002	*With Survey*		*Analytic Sample*	
School	N	N	%	N	%
AHS	98	90	92	90	92
C-AHS	127	55	43	55	40
C-AHS-total	440	199	38	199	44
C-AHS-notAMS	313	144	46	144	46

Descriptive data on the senior survey respondents are presented in Table D15. These results show that across all sites, the senior survey subsamples were not significantly different from the rest of the 11th-grade cohort. Specifically, there were significantly more LEP and special education students in the comparison school subgroups than at AHS, and there were more males in the C-AHS-notAMS subgroup than in the AHS group.

Table D15

Demographic comparison of senior survey respondents, Class of 2002

	AHS		*C-AHS*			*C-AHS-total*			*C-AHS-notAMS*		
Demographics	N	%	N	%		N	%		N	%	
Total	90		55			199			144		
Gender											
Male	33	37	25	46		97	49		72	50	*
Female	57	63	30	55		102	51		72	50	*
Ethnicity											
African American	17	19	10	18		31	16		21	15	
Latino	72	80	45	82		166	83		121	84	
Free/Reduced Lunch											
Yes	80	89	52	95		175	88		123	85	
No	10	11	3	6		24	12		21	15	
Limited English Proficiency											
Yes	51	57	42	76	*	157	79	***	115	80	***
No	39	43	13	24	*	42	21	***	29	20	***
Special Education											
Yes	1	1	5	9	*	24	12	**	19	13	**
No	89	99	50	91	*	175	88	**	125	87	**

Note. AHS had a significantly greater percentage of female students than C-AHS-notAMS, $\chi^2(1, 234) = 3.98$, $p < .05$. AHS had a significantly smaller percentage of LEP students than C-AHS, $\chi^2(1, 145) = 5.76$, $p < .05$, C-AHS-total, $\chi^2(1, 289) = 15.18$, $p < .001$, and C-AHS-notAMS, $\chi^2(1, 234) = 14.45$, $p < .001$. AHS had significantly fewer special education students than C-AHS, $\chi^2(1, 145) = 5.48$, $p < .05$, C-AHS-total, $\chi^2(1, 289) = 9.40$ $p <$ 01, and C-AHS-notAMS, $\chi^2(1, 234) = 10.35$, $p < .001$.

*$p < .05$. **$p < .01$. ***$p < .001$.

The senior survey results in terms of post-high school plans were strikingly similar across all three comparison subgroups (see Tables D16 and D17). Table D16 reports the overall results of the senior survey. In all three subgroups, only the level of significance changes, but the important differences between AHS and each of the subgroups are evident at a glance: significantly more AHS students reported having a post-high school plan than students from any subgroup. AHS students were significantly more likely to report being accepted to college, possibly due to the fact that they were required to apply. Table D17 shows that these subgroups did not differ from AHS in their expectations of full- or part-time employment following high school.

Table D16

Senior survey results, 11th-grade cohort, survey respondents: Overall findings

	AHS			*C-AHS*				*C-AHS-total*				*C-AHS-notAMS*			
Post-High School Trajectory	*Valid* N	*Responded "Yes"* N	%	*Valid* N	*Responded "Yes"* N	%		*Valid* N	*Responded "Yes"* N	%		*Valid* N	*Responded "Yes"* N	%	
Total % with plans	90	83	92	55	40	73	**	199	123	62	***	144	83	58	***
Employment	86	22	26	51	19	37		188	62	33		137	43	31	
College acceptance	89	82	92	48	29	60	***	184	82	45	***	136	53	39	***
Military acceptance	72	0	0	52	3	6	*	190	7	4		138	4	3	

Note. Due to missing data, percentages may not add up to 100. Significance levels are based on chi-square analyses comparing intervention and comparison schools. AHS students were more likely to have overall plans for after high school than students in C-AHS, $\chi^2(1, 145) = 10.08$, $p = .001$, C-AHS-total, $\chi^2(1, 289) = 28.00$, $p < .001$, and in C-AHS-notAMS, $\chi^2(1, 234) = 32.13$, $p < .001$. AHS students were more likely to be college bound than students in C-AHS, $\chi^2(1, 137) = 20.40$, $p < .001$, C-AHS-total, $\chi^2(1, 273) = 56.59$, $p < .001$, and in C-AHS-notAMS, $\chi^2(1, 225) = 63.35$, $p < .001$. AHS students were less likely to be accepted into the military, $\chi^2(1, 124) = 4.26$, $p < .05$, than students in C-AHS.

*$p < .05$. **$p < .01$. ***$p < .001$.

Table D17 takes a closer look at students' reported plans. Of those students who reported acceptance into college, AHS students were significantly more likely to report plans for full-time college attendance than students from any of the three subgroups (see Table D17). AHS students were also significantly less likely to report acceptance into an "other" type of college than students from any of the three subgroups. Both Table D16 and D17 show the same pattern of many of these results: descending positive outcomes by student groups defined by their distance from the larger reform design of Urban Learning Centers that was present at AMS and AHS.

Table D17

Senior survey results, 11th-grade cohort, survey respondents: An in-depth look

	AHS		*C-AHS*			*C-AHS-total*			*C-AHS-notAMS*		
	Responded "Yes"		*Responded "Yes"*			*Responded "Yes"*			*Responded "Yes"*		
Post-High School Trajectory	N	%	N	%		N	%		N	%	
Employed full time	7	33	7	41		17	29		10	24	
Employed part time	14	67	10	59		41	71		31	76	
Attend college full time	78	96	24	83	*	61	77	***	37	74	***
Attend college part time	3	4	5	17	*	18	23	***	13	26	***
Attend four-year college	51	63	17	59		47	59		30	59	
Attend two-year college	30	37	10	35		25	31		15	29	
Attend "other type" college	0	0	2	7	*	8	10	**	6	12	**

Note. Due to missing data, percentages may not add up to 100. Significance levels are based on chi-square analyses comparing intervention and comparison schools. Of those who reported acceptance into college, there were significantly more students at AHS who reported full-time college attendance than in C-AHS, $\chi^2(1, 110) = 5.80$, $p < .05$, in C-AHS-total, $\chi^2(1, 160) = 12.77$, $p < .001$, and in C-AHS-notAMS, $\chi^2(1, 131) = 14.33$, $p < .001$. Of those who reported acceptance into college, there were significantly fewer students at AHS who planned to attend an "other" type college than in C-AHS, $\chi^2(1, 110) = 5.69$, $p < .05$, in C-AHS-total, $\chi^2(1, 161) = 8.52$, $p < .01$, and in C-AHS-notAMS, $\chi^2(1, 132) = 9.98$, $p < .01$.
**p* < .05. ***p* < .01. ****p* < .001.

We concluded in the main body of the report that the culture of achievement at AHS began at AMS and was then sustained in high school. This culture created a group of students who were very planful of their futures. Therefore, it is not surprising to find that students in the C-AHS subgroup performed better than their comparison school peers and had senior survey results closest to those of AHS students, since these students had also attended AMS. Similarly, those students at the comparison school who had never attended AMS had outcomes least like AHS students and appeared to be the least planful of their futures of all groups.

Post-high school plans and student characteristics. We next explored the relationship between the school effect and other independent effects on the key questions of post-high school plans. The odds that AHS students had made post-high school plans at all were 4.5-11.3 times higher than the subgroups (see Table D18). There were, however, no significant differences in the odds of students from any subgroup planning to work, work full-time, or join the military (see Tables D19, D20, and D21). In one comparison, the CTE credit ratio had a negative effect on the full-time employment plans of students, independent of school effect (see Table D20). One possible explanation for this finding is that students who took more CTE became more invested in other postschool options (e.g., education). There is some evidence to support this notion in the reported educational plans for after high school.

Table D18

Logistic regression predicting plans for after high school, 11th-grade cohort, senior survey respondents

	AHS and C-AHS				AHS and C-AHS-total				AHS and C-AHS-notAMS			
	Cox & Snell $R^2 = .122$				Cox & Snell $R^2 = .142$				Cox & Snell $R^2 = .182$			
	Nagelkerke $R^2 = .213$				Nagelkerke $R^2 = .203$				Nagelkerke $R^2 = .261$			
	N *for model* = 144				N *for model* = 286				N *for model* = 232			
	Test of model = 18.78**				*Test of model* = 43.65***				*Test of model* = 46.71***			
Variable	*B*	*SE B*	*Exp(B)*		*B*	*SE B*	*Exp(B)*		*B*	*SE B*	*Exp(B)*	
Intervention	1.52	.61	4.55	*	2.08	.46	8.04	***	2.43	.49	11.34	***
Latino	-.78	.89	.46		-.66	.66	.52		-.71	.76	.49	
Male	-.46	.50	.63		-.14	.28	.87		-.05	.33	.95	
Free/Red Lunch	.95	.88	2.58		.19	.47	1.21		-.11	.52	.89	
Special Education	7.22	24.07	1364.80		1.12	.58	3.05		.99	.61	2.69	
LEP	.76	.71	2.14		.14	.54	1.15		.14	.61	1.15	
CTE Credit Ratio	10.51	8.02	36651.32		-.23	3.92	.80		-4.66	4.66	.01	
Graduation Status					6.54	15.72	693.25		6.25	15.73	516.60	
Constant	-.37	1.02	.69		-5.79	15.73	.00		-5.16	15.74	.01	

Note. All coefficients rounded to two digits.
Free/Red Lunch = Free/Reduced Lunch. LEP = Limited English Proficiency.
*$p < .05$. ***$p < .001$.

Table D19

Logistic regression predicting employment, 11th-grade cohort, senior survey respondents

	AHS and C-AHS			AHS and C-AHS-total			AHS and C-AHS-notAMS			
	Cox & Snell $R^2 = .029$			Cox & Snell $R^2 = .039$			Cox & Snell $R^2 = .043$			
	Nagelkerke $R^2 = .041$			Nagelkerke $R^2 = .055$			Nagelkerke $R^2 = .061$			
	N *for model* = 136			N *for model* = 272			N *for model* = 222			
	Test of model = 3.94			*Test of model* = 10.84			*Test of model* = 9.74			
Variable	*B*	*SE B*	*Exp(B)*	*B*	*SE B*	*Exp(B)*	*B*	*SE B*	*Exp(B)*	
Intervention	-.69	.45	.50	-.54	.34	.58	-.34	.38	.71	
Latino	-.23	.64	.80	-.11	.52	.90	-.36	.58	.70	
Male	-.03	.40	.97	.02	.27	1.03	.19	.31	1.21	
Free/Reduced Lunch	.97	.86	2.65	.45	.47	1.56	.46	.51	1.58	
Special Education	-.17	.93	.84	.84	.46	2.31	1.03	.52	2.81	*
LEP	-.12	.53	.89	-.33	.45	.72	-.13	.49	.88	
CTE Credit Ratio	6.08	6.70	435.37	5.39	4.01	220.11	3.18	4.72	24.00	
Graduation Status				5.44	15.73	230.27	5.34	15.72	207.69	
Constant	-1.56	.99	.21	-6.62	15.74	.00	-6.50	15.73	.00	

Note. All coefficients rounded to two digits.
LEP = Limited English Proficiency.
*$p < .05$.

Table D20
Logistic regression predicting full-time employment, 11th-grade cohort, senior survey respondents

	AHS and C-AHS			*AHS and C-AHS-total*			*AHS and C-AHS-notAMS*			
	Cox & Snell R^2 = .179 *Nagelkerke R^2 = .246* N *for model = 37* *Test of model = 7.30*			*Cox & Snell R^2 = .090* *Nagelkerke R^2 = .128* N *for model = 78* *Test of model = 7.35*			*Cox & Snell R^2 = .168* *Nagelkerke R^2 = .244* N *for model = 62* *Test of model = 11.44*			
Variable	*B*	*SE B*	*Exp(B)*	*B*	*SE B*	*Exp(B)*	*B*	*SE B*	*Exp(B)*	
Intervention	-.77	.84	.46	-.09	.63	.92	.88	.79	2.40	
Latino	1.45	1.52	4.24	1.76	1.01	5.83	2.00	1.23	7.42	
Male	1.27	.86	3.57	.46	.54	1.59	.32	.64	1.38	
Free/Red Lunch	-.88	1.95	.42	.33	.94	1.39	1.21	1.28	3.34	
Special Education	-7.71	36.67	.00	-1.40	1.12	.25	-1.07	1.23	.34	
LEP	-.91	1.20	.41	-1.52	.83	.22	-1.61	.96	.20	
CTE Credit Ratio	12.08	11.84	175882.25	-2.24	7.46	.11	-26.13	11.81	.00	*
Constant	-1.39	2.14	.25	-1.47	1.00	.23	-1.34	1.26	.26	

Note. All coefficients rounded to two digits.
Free/Red Lunch = Free/Reduced Lunch. LEP = Limited English Proficiency.
*$p < .05$.

Table D21
Logistic regression predicting acceptance into the military, 11th-grade cohort, senior survey respondents

	AHS and C-AHS			*AHS and C-AHS-total*				*AHS and C-AHS-notAMS*		
	Cox & Snell R^2 = .063 *Nagelkerke R^2 = .307* N *for model = 124* *Test of model = 8.02*			*Cox & Snell R^2 = .089* *Nagelkerke R^2 = .405* N *for model = 260* *Test of model = 24.23***				*Cox & Snell R2 = .133* *Nagelkerke R2 = .766* N *for model = 208* *Test of model = 29.57****		
Variable	*B*	*SE B*	*Exp(B)*	*B*	*SE B*	*Exp(B)*		*B*	*SE B*	*Exp(B)*
Intervention	-11.28	89.20	.00	-7.73	50.82	.00		1.99	240.02	7.28
Latino	-6.41	62.99	.00	-6.03	39.25	.00		-.97	436.48	.38
Male	.84	1.33	2.33	1.74	1.19	5.72		12.70	147.56	328151.97
Free/Red Lunch	9.18	175.04	9651.27	.06	1.49	1.06		-8.40	121.76	.00
Special Ed	1.31	1.41	3.71	2.80	.94	16.41	**	21.36	173.51	1880202444.74
LEP	5.56	62.98	260.89	4.83	39.25	125.62		-1.87	436.48	.15
CTE Credit Ratio	-5.74	18.17	.00		11.85	.00		-33.14	28.28	.00
Graduation				7.22	305.76	1366.54		-9.82	1294.40	.00
Constant	-11.62	175.04	.00	-11.34	305.77	.00		-13.40	1296.90	.00

Note. All coefficients rounded to two digits.
Free/Red Lunch = Free/Reduced Lunch. Special Ed = Special Education. LEP = Limited English Proficiency.
**$p < .01$.

Going to AHS appeared to have positive effects in terms of students' plans to continue their education. The odds that AHS students reported that they had been accepted to college were 9-26 times greater than the subgroups (see Table D22), with the order of those probabilities falling in the now-familiar order. However, among those accepted to college, there were no differences in the odds of attending college full-time in the comparison between AHS students and C-AHS students (see Table D23). The odds that AHS students were planning to attend college full time were over 14 times greater than for the C-AHS-notAMS students. There were no significant differences between AHS students and any of the subgroups in plans to attend four-year or two-year colleges (see Tables D24 and D25). Interestingly, the CTE credit ratio was a significant predictor of planning to attend a two-year college, independent of the high school attended. This suggests that for those who were planning college, the more CTE coursework they took, the more inclined they were to choose a two-year college. This finding is consistent with the 2004 NAVE report (Silverberg et al., 2004) that linked CTE course-taking to two-year college attendance.

Table D22

Logistic regression predicting college acceptance, 11th-grade cohort, senior survey respondents

	AHS and C-AHS				*AHS and C-AHS-total*				*AHS and C-AHS-notAMS*			
	Cox & Snell R^2 *= .165* *Nagelkerke* R^2 *= .265* N *for model = 137* *Test of model = 24.70***				*Cox & Snell* R^2 *= .231* *Nagelkerke* R^2 *= .312* N *for model = 271* *Test of model = 71.11****				*Cox & Snell* R^2 *= .305* *Nagelkerke* R^2 *= .413* N *for model = 223* *Test of model = 81.26****			
Variable	*B*	*SE B*	*Exp(B)*		*B*	*SE B*	*Exp(B)*		*B*	*SE B*	*Exp(B)*	
Intervention	2.20	.61	9.01	***	2.86	.48	17.39	***	3.25	.53	25.70	***
Latino	-.41	.84	.66		-.74	.66	.48		-.91	.75	.41	
Male	-.27	.49	.77		-.06	.29	.94		-.11	.34	.82	
Free/Red Lunch	.38	.90	1.46		.34	.47	1.41		.26	.53	1.20	
Special Ed	1.25	1.18	3.48		-.53	.47	.59		-.97	.50	.33	
LEP	1.00	.74	2.71		.61	.57	1.85		.62	.60	1.87	
CTE Credit Ratio	7.63	7.50	2054.44		-2.98	3.98	.05		-8.15	5.03	.00	
Graduation					6.06	15.73	427.00		5.74	15.73	309.61	
Constant	-.80	1.04	.45		-6.17	15.74	.00		-5.52	15.74	.00	

Note. All coefficients rounded to two digits.
Free/Red Lunch = Free/Reduced Lunch. Special Ed = Special Education. LEP = Limited English Proficiency.
***p < .001.

Table D23

Logistic regression predicting full-time college attendance, 11th-grade cohort, senior survey respondents

	AHS and C-AHS Cox & Snell R^2 = .092 Nagelkerke R^2 = .226 N for model = 110 Test of model = 10.61			AHS and C-AHS-total Cox & Snell R^2 = .147 Nagelkerke R^2 = .272 N for model = 160 Test of model = 25.48**				AHS and C-AHS-notAMS Cox & Snell R^2 = .206 Nagelkerke R^2 = .393 N for model = 131 Test of model = 30.18***			
Variable	*B*	*SE B*	*Exp(B)*	*B*	*SE B*	*Exp(B)*		*B*	*SE B*	*Exp(B)*	
Intervention	.72	1.09	2.06	1.64	.75	5.15	*	2.66	.87	14.29	**
Latino	-.65	1.57	.53	-.36	1.33	.70		.90	1.34	2.46	
Male	-.16	.81	.86	-.04	.53	.94		.18	.66	1.20	
Free/Red Lunch	-5.95	30.85	.00	-6.83	22.91	.00		-7.27	23.64	.00	
Special Ed	-.35	1.37	.71	-1.87	.79	.15	*	-3.55	1.43	.03	*
LEP	.46	1.25	1.58	-.42	1.12	.64		-.48	1.19	.62	
CTE Credit Ratio	25.64	13.91	136601651649.03	2.60	7.23	14.30		-13.32	9.90	.00	
Constant	6.52	30.87	677.96	8.83	23.00	6827.05		8.65	23.64	5687.46	

Note. All coefficients rounded to two digits.
Free/Red Lunch = Free/Reduced Lunch. Special Ed = Special Education. LEP = Limited English Proficiency.
**p* < .05. ***p* < .01.

Table D24

Logistic regression predicting attending a four-year college, 11th-grade cohort, senior survey respondents

	AHS and C-AHS Cox & Snell R^2 = .047 Nagelkerke R^2 = .064 N for model = 110 Test of model = 5.32				AHS and C-AHS-total Cox & Snell R^2 = .049 Nagelkerke R^2 = .067 N for model = 161 Test of model = 8.13				AHS and C-AHS-notAMS Cox & Snell R^2 = .071 Nagelkerke R^2 = .096 N for model = 132 Test of model = 9.67			
Variable	*B*	*SE B*	*Exp(B)*		*B*	*SE B*	*Exp(B)*		*B*	*SE B*	*Exp(B)*	
Intervention	.14	.52	1.14		.35	.41	1.42		.67	.51	1.94	
Latino	-.70	.69	.50		-.41	.61	.66		-.14	.65	.87	
Male	-.51	.42	.60		-.40	.34	.67		-.30	.38	.74	
Free/Red Lunch	-.76	.85	.47		-.61	.63	.54		-1.02	.70	.36	
Special Education	-.23	1.01	.80		-.13	.72	.88		.27	.99	1.32	
LEP	.02	.54	1.02		-.16	.50	.85		-.32	.52	.73	
CTE Credit Ratio	-5.16	7.31	.01		-8.20	5.42	.00		-12.85	7.09	.00	
Constant	2.29	1.15	9.88	*	2.04	.73	7.67	**	2.36	.82	10.55	**

Note. All coefficients rounded to two digits.
Free/Red Lunch = Free/Reduced Lunch. LEP = Limited English Proficiency.
**p* < .05. ***p* < .01.

Table D25

Logistic regression predicting attending a two-year college, 11th-grade cohort, senior survey respondents

	AHS and C-AHS				*AHS and C-AHS-total*				*AHS and C-AHS-notAMS*			
	Cox & Snell R^2 = .050 *Nagelkerke R^2 = .069* N *for model = 110* *Test of model = 5.69*				*Cox & Snell R^2 = .072* *Nagelkerke R^2 = .099* N *for model = 161* *Test of model = 12.01*				*Cox & Snell R^2 = .116* *Nagelkerke R^2 = .161* N *for model = 132* *Test of model = 16.35**			
Variable	*B*	*SE B*	*Exp(B)*		*B*	*SE B*	*Exp(B)*		*B*	*SE B*	*Exp(B)*	
Intervention	.30	.54	1.34		.08	.42	1.09		-.27	.53	.76	
Latino	.65	.69	1.91		.14	.62	1.15		-.17	.67	.84	
Male	.68	.42	1.98		.66	.36	1.93		.49	.40	1.63	
Free/Red Lunch	.72	.85	2.05		1.43	.80	4.19		2.27	1.08	9.67	*
Special Ed	.44	1.02	1.55		-.06	.76	.95		-.91	1.18	.40	
LEP	-.05	.54	.96		.01	.51	1.01		.20	.53	1.22	
CTE Credit Ratio	1.98	7.49	7.26		8.65	5.65	5727.48		16.02	7.58	9057920.96	*
Constant	-2.40	1.16	.09	*	-3.05	.90	.05	**	-3.96	1.20	.02	**

Note. All coefficients rounded to two digits.
Free/Red Lunch = Free/Reduced Lunch. Special Ed = Special Education. LEP = Limited English Proficiency.
*p < .05. **p < .01.

Attending the Community College

We developed a separate sample to explore the in-college effects of attending AHS or its comparison school. This sample included graduates from both high schools who attended the local community college (ACC). The demographic analyses are found in Tables D26, D27, and D28. Table D26 shows no significant differences between the AHS and C-AHS students who attended ACC. There were significantly fewer African American students and significantly more Latino students among those attending ACC from C-AHS-total than not attending (see Table D27). Tables D27 and D28 show a greater percentage of LEP students from C-AHS-total and C-AHS-not AMS attending ACC than not attending ACC. These differences in demographics, as well as the small numbers of students in the subgroups, should be kept in mind during the following discussion.

Table D26

Background characteristics of students who graduated from high school and attended ACC versus those who graduated from high school and did not attend ACC, AHS and C-AHS, 11th-grade cohort

	AHS						*C-AHS*					
	Attended ACC		*Did Not Attend ACC*		*Total*		*Attended ACC*		*Did Not Attend ACC*		*Total*	
Demographics	N	%	N	%	N	%	N	%	N	%	N	%
Total	13	13	85	87	98		11	13	75	87	86	
Gender												
Male	6	46	28	33	34	35	6	55	31	41	37	43
Female	7	54	57	67	64	65	5	46	44	59	49	57
Ethnicity												
African American	2	15	18	21	20	21	0	0	20	27	20	23
Latino	11	85	66	79	77	79	11	100	55	73	66	77
Free/Reduced Lunch												
Yes	12	92	75	88	87	89	10	91	68	91	78	91
No	1	8	10	12	11	11	1	9	7	9	8	9
Limited English Proficiency												
Yes	8	62	48	57	56	57	10	91	50	67	60	70
No	5	39	37	44	43	43	1	9	25	33	26	30
Special Education												
Yes	0	0	1	1	1	1	1	9	8	11	9	1
No	13	100	84	99	97	99	10	91	67	89	77	89

Table D27

Background characteristics of students who graduated from high school and attended ACC versus those who graduated from high school and did not attend ACC, AHS and C-AHS-total, 11th-grade cohort

	AHS						*C-AHS-total*						
	Attended ACC		*Did Not Attend ACC*		*Total*		*Attended ACC*		*Did Not Attend ACC*			*Total*	
Demographics	N	%	N	%	N	%	N	%	N	%		N	%
Total	13	13	85	87	98		26	8	297	92		323	
Gender													
Male	6	46	28	33	34	35	15	58	129	43		144	47
Female	7	54	57	67	64	65	11	42	168	57		179	56
Ethnicity													
African American	2	15	18	21	20	21	0	0	58	20	*	58	18
Latino	11	85	66	79	77	79	26	100	237	80	*	263	81
Free/Reduced Lunch													
Yes	12	92	75	88	87	89	25	96	251	85		276	85
No	1	8	10	12	11	11	1	4	46	16		47	15
Limited English Proficiency													
Yes	8	62	48	57	56	57	25	96	223	75	*	248	77
No	5	39	37	44	43	43	1	4	74	25	*	75	23
Special Education													
Yes	0	0	1	1	1	1	2	8	37	13		39	12
No	13	100	84	99	97	99	24	92	260	88		284	88

Note. A significant difference in ethnicity was found: there were fewer African American students among those attending ACC from C-AHS-total, $\chi^2(1, 323) = 6.19$, $p < .05$, and more Latino students attending ACC from C-AHS-total, $\chi^2(1, 323) = 6.45$, p < .05. There was also a greater percentage of LEP students from C-AHS-total attending ACC than not attending ACC, $\chi^2(1, 323) = 5.95$, $p < .05$.
*$p < .05$.

Table D28

Background characteristics of students who graduated from high school and attended ACC versus those who graduated from high school and did not attend ACC, AHS and C-AHS-notAMS, 11th-grade cohort

	AHS						*C-AHS-notAMS*						
	Attended ACC		*Did Not Attend ACC*		*Total*		*Attended ACC*		*Did Not Attend ACC*			*Total*	
Demographics	N	%	N	%	N	%	N	%	N	%		N	%
Total	13	13	85	87	98		15	6	222	94		237	
Gender													
Male	6	46	28	33	34	35	9	60	98	44		107	45
Female	7	54	57	67	64	65	6	40	124	56		130	55
Ethnicity													
African American	2	15	18	21	20	21	0	0	38	17		38	16
Latino	11	85	66	79	77	79	15	100	182	83		197	84
Free/Reduced Lunch													
Yes	12	92	75	88	87	89	15	100	183	83		198	84
No	1	8	10	12	11	11	0	0	39	18		39	17
Limited English Proficiency													
Yes	8	62	48	57	56	57	15	100	173	78	*	188	79
No	5	39	37	44	43	43	0	0	49	22	*	49	21
Special Education													
Yes	0	0	1	1	1	1	1	7	29	13		30	13
No	13	100	84	99	97	99	14	93	193	87		207	87

Note. There was a greater percentage of LEP students from C-AHS-notAMS attending ACC than not attending ACC, $\chi^2(1, 237) = 4.17$, $p < .05$.
*$p < .05$.

Remediation. ACC supplied information on the need for remediation by graduates of the two high schools. The college data did not distinguish between math and reading remediation. There were no significant differences between AHS and each of the three subgroups in the need for remedial coursework at ACC (see Table D29). About 60% of students from each subgroup required remedial coursework. The model for the logistic regression was not significant in predicting overall remediation, probably due to the small sample sizes (see Table D30). However, CTE emerged as a significant negative predictor of the need for remediation independent of the high school attended: the more CTE classes students took, regardless of high school attended, the less likely they were to need remediation at ACC.

Table D29

Need for remediation, 11th-grade cohort, attended ACC and graduated from high school

	AHS			*C-AHS*			*C-AHS-total*			*C-AHS-notAMS*		
	Valid	*Responded "Yes"*		*Valid*	*Responded "Yes"*		*Valid*	*Responded "Yes"*		*Valid*	*Responded "Yes"*	
	N	N	%	N	N	%	N	N	%	N	N	%
Overall remediation	13	8	62	11	7	64	26	16	62	15	9	60

Table D30

Logistic regression predicting need for remediation, 11th-grade cohort, attended ACC and graduated from high school

	AHS and C-AHS			*AHS and C-AHS-total*				*AHS and C-AHS-notAMS*		
	Cox & Snell R^2 = .310 *Nagelkerke R^2 = .423* N *for model = 24* *Test of model = 8.91*			*Cox & Snell R^2 = .280* *Nagelkerke R^2 = .380* N *for model = 39* *Test of model = 12.81*				*Cox & Snell R^2 = .322* *Nagelkerke R^2 = .426* N *for model = 28* *Test of model = 10.88*		
Variable	*B*	*SE B*	*Exp(B)*	*B*	*SE B*	*Exp(B)*		*B*	*SE B*	*Exp(B)*
Intervention	1.47	1.69	4.34	.90	1.03	2.46		1.08	1.22	2.956
Latino	8.50	63.93	4888.47	9.04	62.50	8425.42		10.33	99.64	30717.45
Male	.64	1.03	1.90	-.26	.79	.77		-.84	.97	.43
Free/Red Lunch	-16.63	90.36	.00	-16.54	88.36	.00		-18.41	140.90	.00
Special Education	-9.57	99.64	.00	-9.00	67.53	.00	*	-7.51	99.64	.00
LEP	-.69	1.53	.50	-.79	1.47	.45		-1.12	1.52	.33
CTE Credit Ratio	-40.53	29.32	.00	-36.23	17.78	.00	*	-51.84	26.59	.00
Constant	11.35	63.96	85013.25	11.40	62.51	88965.04		13.88	99.66	1069330.68

Note. All coefficients rounded to two digits.
Free/Red Lunch = Free/Reduced Lunch. LEP = Limited English Proficiency.
*$p < .05$.

Credits earned. The mean number of credits earned in the first year of college was higher for AHS graduates than for graduates from any of the three subgroups, and significantly higher than the mean number of credits earned by students in the C-AHS subgroup (see Table D31). This significant difference is interesting because this is the group most like the AHS students. As we saw in the high school portion of this appendix, comparison group students who had attended AMS tended to perform most like AHS of all the subgroups on measures of high school achievement. However, in community college, this group earned significantly fewer credits than the AHS graduates. Perhaps the AMS culture of achievement was important for high school performance, but the AMS effect was no longer able to influence performance post-high school. Perhaps it is the high school experience that better predicts post-high school achievement—this is borne out by the similar number of credits earned by each of the subgroups from the comparison school. The regression model failed to predict cumulative credits earned (see Table D32).

Table D31

Credits earned and cumulative GPA, 11th-grade cohort, attended ACC and graduated from high school

	AHS		C-AHS			C-AHS-total		C-AHS-notAMS	
Achievement	N	*Mean (SD)*	N	*Mean (SD)*		N	*Mean (SD)*	N	*Mean (SD)*
Credits earned	13	24.31 (20.23)	11	11.00 (5.06)	*	26	15.27 (13.44)	15	18.40 (16.72)
Cumulative GPA	13	2.05 (1.10)	11	1.69 (0.81)		24	1.80 (0.86)	13	1.90 (0.92)

*$p < .05$.

Table D32

Linear regression predicting credits earned, 11th-grade cohort, attended ACC and graduated from high school

	AHS and C-AHS			AHS and C-AHS-total			AHS and C-AHS-notAMS		
	Adjusted R^2 = 0.046 N *for model* = 23			Adjusted R^2 = -0.012 N *for model* = 38			Adjusted R^2 = -0.102 N *for model* = 27		
Variable	*B*	*SE B*	*ß*	*B*	*SE B*	*ß*	*B*	*SE B*	*ß*
Intervention	9.28	9.98	.29	7.03	7.39	.21	1.54	9.57	.04
Latino	-2.12	15.17	-.04	-.27	15.13	-.00	11.31	22.81	.16
Male	10.60	7.26	.33	3.38	5.66	.11	3.42	7.80	.10
Free/Reduced Lunch	-13.16	15.69	-.23	-8.89	15.50	-.12	-26.00	27.21	-.27
Special Education	-11.82	17.55	-.15	-18.08	12.78	-.25	-29.97	21.43	-.31
LEP	13.35	10.92	.36	12.35	10.66	.28	9.66	13.44	.21
CTE Credit Ratio	193.50	179.57	.35	147.70	117.50	.27	220.18	177.19	.33
Constant	-3.20	20.92		2.00	17.98		8.00	26.07	

Note. All coefficients rounded to two digits.
LEP = Limited English Proficiency.

Cumulative GPA. There were no significant differences in the mean cumulative GPA for AHS graduates and for graduates from each of the three comparison school subgroups at ACC (see Table D31). Lack of significance for these findings may be due in part to the very small sample sizes for each subgroup. The only significant finding occurred in the regression model, in the comparison between AHS and C-AHS-notAMS (see Table D33). There, special education status was a significant predictor of cumulative GPA, meaning that if a student received special education services in high school, the more likely their community college cumulative GPA would be lower.

Table D33

Linear regression predicting cumulative GPA, 11th-grade cohort, attended ACC and graduated from high school

	AHS and C-AHS			*AHS and C-AHS-total*			*AHS and C-AHS-notAMS*			
	Adjusted R^2 = -0.149 N *for model = 23*			*Adjusted R^2 = -0.063* N *for model = 36*			*Adjusted R^2 = -0.027* N *for model = 25*			
Variable	*B*	*SE B*	*ß*	*B*	*SE B*	*ß*	*B*	*SE B*	*ß*	
Intervention	-.48	.65	-.25	-.19	.44	-.10	-.41	.51	-.21	
Latino	-.74	.99	-.21	-.57	.90	-.14	-.03	1.20	-.01	
Male	.23	.47	.12	.02	.34	.01	.25	.42	.13	
Free/Reduced Lunch	.72	1.02	.21	.64	.92	.16	-.39	1.43	-.087	
Special Education	-.43	1.14	-.09	-1.31	.76	-.32	-2.65	1.14	-.52	*
LEP	.33	.71	.15	.09	.63	.04	-.06	.71	-.02	
CTE Credit Ratio	20.13	11.68	.62	9.25	7.09	.29	12.17	9.70	.33	
Constant	.21	1.36		1.17	1.07		1.57	1.40		

Note. All coefficients rounded to two digits.
LEP = Limited English Proficiency.
*$p < .05$.

Attending the community college: Summary. The analyses of community college data did not reveal many significant differences between the AHS students and comparison school subgroups of students. Most students needed some form of remediation, regardless of high school attended. These groups did not differ in their cumulative GPA, but AHS students earned more credits than all of the subgroups, and earned significantly more credits than the C-AHS students.

There were fewer differences across groups in the postsecondary outcomes than the high school outcomes (see Table D34). It is possible that the subgroups who attended AMS were able to draw upon the culture of achievement fostered by Urban Learning Centers at AHS and that this held them in good stead through high school, but was too far removed from them to support them in college. Another possible reason for the lack of differences in postsecondary outcomes could be the small sample sizes from each high school that attended ACC. Finally, a third reason for the outcomes observed could be that the better-performing AHS students attended four-year colleges, not ACC. This last explanation has some support in the qualitative findings in the main body of the report.

Table D34

Summary of results: Engagement, achievement, and transition, AHS comparison groups

	AHS compared to:			
Engagement – 9th-grade cohort	*C-AHS*	*C-AHS-notapplied*	*C-AHS-total*	*C-AHS-notAMS*
Attendance	↔	↑	↑	↑
Less risk of dropout	↔	↑	↑	↑
CTE coursework associated with decreased risk of dropping out	√	√	√	√
Achievement – 9th-grade cohort				
Promotion progress (3 years)	↓↓↔ [a]	↓↓↔	↓↓↔	↓↓↔
Math credits earned	↑	↔	↑	↑
Odds of earning high math credits	↑	↑	↑	↑
Science credits earned	↔	↔	↓	↔
Odds of earning science credits	↔	↔	↔	↔
CTE credits earned	↑	↑	↑	↑
Odds of earning CTE credits	↑	↑	↑	↑
Odds of graduating on time	↔	↔	↑	↑

	AHS compared to:[b]		
Transition – 11th-grade cohort	*C-AHS*	*C-AHS-total*	*C-AHS-notAMS*
Has a post-high school plan	↑	↑	↑
Accepted to college	↑	↑	↑
Plans to attend college full time	↑	↑	↑
Plans to attend 4-year college	↔	↔	↔
Plans to attend 2-year college	↔	↔	↔
Plans to work full time	↔	↔	↔
Community college			
Need for remediation	↔	↔	↔
Credits earned	↑	↔	↔
Cumulative GPA	↔	↔	↔

Note. All differences noted are significant.
↑ = AHS had a better outcome than the subgroup.
↓ = AHS had a worse outcome.
↔ = no difference between AHS and the subgroup.
√ = CTE to academic course ratio was a significant negative predictor of dropout.
[a] This row shows promotion progress results for each of three years, where each year is represented by one arrow. Each arrow is a loose average across all subgroups for that year.
[b] The transition analyses are from the 11th-grade cohort which has only three subgroups, not four like the 9th-grade cohort.