

# WHAT'S IN A PATHWAY?

## EVIDENCE INDICATES THAT INTEGRATED COLLEGE AND CAREER PATHWAYS PROVIDE MORE BENEFIT FOR STUDENTS

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In 2010 the California Department of Education published *Multiple Pathways to Student Success: Envisioning the New California High School*, which described a multi-faceted model of college and career pathways and encouraged their further development, based on existing evidence that

“Pathways ... that effectively integrate both academic and career technical content, problem-based instructional strategies, work-based learning opportunities, and support services have the potential to transform our state’s public high schools into twenty-first century learning centers that effectively prepare all students to pursue multiple options beyond high school graduation.” (p. i)

New evidence and policy developments since 2010 have reinforced this rationale, adding to the drive to enroll more students in these integrated pathways. This paper<sup>1</sup> will describe recent developments, and point to some current challenges. Recent policy developments, and recent evidence, both reinforce the value of combining CTE with other elements in a pathway format.

The following sections will

- Summarize recent policy commitments to prepare students for “college and careers.”
- Explain how integrating college and career preparation solves a long-standing dilemma for high schools.
- Review evidence on student benefits from integrated pathways that blend college and career preparation with work-based learning (WBL) and student supports.
- Review evidence that high school career and technical education (CTE) by itself does not produce as much benefit for students as pathways that combine CTE with college-prep coursework along with WBL and student supports.

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<sup>1</sup> Some paragraphs in this paper are adapted from David Stern (2015), *Pathways or Pipelines: Keeping high school students' future options open while developing technical skills and knowledge* (background paper for the National Academy of Sciences Committee on The Supply Chain for Middle-Skill Jobs: Education, Training, and Certification Pathways). [http://sites.nationalacademies.org/cs/groups/pgasite/documents/webpage/pga\\_167702.pdf](http://sites.nationalacademies.org/cs/groups/pgasite/documents/webpage/pga_167702.pdf)

## STATE POLICY EMBRACES “COLLEGE AND CAREER” PREPARATION AS GOAL FOR HIGH SCHOOL, BUT INTERPRETATIONS VARY

One of the most significant recent policy developments affecting K12 education in California was adoption of the Common Core State Standards (CCSS) by the State Board of Education on August 2, 2010. The overall goal of the CCSS is “preparing American’s students for college and career.” It is significant that the phrase is “college *and* career,” not “college *or* career.” This reflects a widespread policy shift away from the 20<sup>th</sup> century view that high schools should prepare some students for college while equipping other students for immediate entry into full-time employment. The 1917 Smith-Hughes Act, which first authorized federal funding for vocational education, limited the use of funds to preparation for occupations *not* requiring a bachelor’s degree – a restriction that stayed in place until Congress finally removed that ceiling when it reauthorized the Perkins Act in 2006. In the debate preceding the Smith-Hughes Act, John Dewey and others argued that creating a separate vocational curriculum would artificially separate theory from practice, and would lead to segregating students along socioeconomic lines (Kliebard, 1999; Lazerson & Grubb, 1974). The recent transformation of vocational education as a non-college track into CTE as an integral part of preparation for post-secondary education is intended to overcome the problems Dewey and others correctly foresaw.

A second major policy development since the 2010 report was Legislative passage of budget language setting aside a total of \$500 million for the California Career Pathways Trust (CCPT). The CCPT language directed the funds to be used “for K–14 career pathways programs,” linking K-12 with community college. The language did not explicitly call for extension of these pathways into bachelor’s degree programs.

In addition to these California policy developments, federal initiatives since 2010 also have supported development of career pathways that link secondary and postsecondary education and training. On April 4, 2012 the U.S. Department of Education issued a joint letter with the Department of Labor and the Department of Health and Human Services “to promote the use of career pathways approaches as a promising strategy to help adults acquire marketable skills and industry-recognized credentials through better alignment of education, training and employment, and human and social services among public agencies and with employers.”<sup>2</sup> The first desired component of these pathways is “alignment of secondary and postsecondary education with workforce development systems and human services.” In addition, in 2014, the U.S. Department of Labor awarded 24 Youth CareerConnect grants totaling \$107 million for localities to “re-design the teaching and learning experience for youth to more fully prepare them with the knowledge, skills, and industry-relevant education needed to get on the pathway to a successful career, including postsecondary education or registered apprenticeship.”<sup>3</sup> Although California received two of the 24 awards, the impact of federal policy is dwarfed by the state’s own investment in career pathways since 2010.

The emphasis of CCPT on connecting K-12 with community college has generated several different interpretations of how pathways will be designed to achieve the CCSS goal of preparing students for “college and career.” One widespread interpretation construes “college” as including

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<sup>2</sup> [https://careertech.org/sites/default/files/Joint\\_Letter\\_Career\\_Pathways.pdf](https://careertech.org/sites/default/files/Joint_Letter_Career_Pathways.pdf)

<sup>3</sup> <https://www.whitehouse.gov/the-press-office/2014/04/07/fact-sheet-youth-careerconnect>

all postsecondary education or training, possibly including bachelor's degree programs but not necessarily right after high school.

However, this interpretation sidesteps the issue of whether every pathway should give students access to the so-called "a-g" courses, a sequence of at least 15 year-long courses required for admission to California State University (CSU) or the University of California (UC). Since UC and CSU enroll most of the California students who participate in bachelor's degree programs, failure to provide access to the a-g courses seriously limits the postsecondary educational options open to students graduating from high school.

This is a subtle issue. Rosenbaum (2001), Schwartz (2004) and others have argued that providing a high school curriculum consisting entirely of college-prep academic coursework is unrealistic, since most students do not attain a bachelor's degree. But designing some high school pathways in a way that precludes admission to a bachelor's degree program upon graduation can re-create a system of inequitable tracking. This dilemma is more fully explored in the next section.

From an implementation perspective, including the whole a-g sequence within or alongside the CTE pathway courses in high school is a real challenge. Since the state is not directing localities to include a-g courses in or alongside all pathways, but also is not trying to discourage localities from doing so, that decision is devolving to the regional, district, and school site levels. However, the evidence from longitudinal studies, summarized below, continues to find greater benefits from pathways that combine CTE and academic coursework with work-based learning and student supports, compared to pathways that consist of CTE alone.

## **HOW CAREER AND COLLEGE PATHWAYS CAN SOLVE A DILEMMA FOR HIGH SCHOOLS**

Despite differences on the a-g issue, there is nearly universal agreement that every career pathway should provide access to some kind of postsecondary education, rather than preparing students only for immediate entry into full-time employment after high school. Well-designed career and college pathways in high school keep students' future options open by combining CTE and college-prep coursework with work-based learning opportunities for students to take real responsibility in the world of adult professional work. The integration of theory and practice makes high school more interesting – sometimes even exciting – for many students, and increases the likelihood that they will become lifelong learners. Students who graduate from these pathways may or may not go on to postsecondary education in the same field as their high school concentration, and they may or may not choose to enroll in baccalaureate or advance degree programs. College-and-career pathways are designed to help students make these decisions based on their own interests and capabilities, and to adapt to the unforeseen new technologies and conditions of work they will certainly face over their working lifetimes.

Hundreds of statistical studies have determined that the amount of formal schooling a person completes is the strongest correlate of occupational success, usually measured by earnings in mid-career or over a lifetime (National Research Council, 2012; Bowles, Gintis, & Osborne,

2001). Recent studies in the U.S. have continued to find a high correlation between earnings and educational attainment, in particular attainment of a bachelor's or advanced degree (Carnevale, Rose, & Cheah, nd; Pew Research Center, 2014). Accordingly, a large majority of high school students want to attain a bachelor's or advanced degree (U.S. Department of Education, 2011). Students and their parents often know that such degrees provide better access to managerial and professional jobs with higher salaries, along with more comfortable working conditions, greater employment security, and other benefits. Even among high school seniors who have taken three or more CTE classes in the same field (called CTE concentrators by the National Assessment of Career and Technical Education), 54 percent in 2004 expected to earn a bachelor's or advanced degree — up sharply from 22 percent in 1982 (Dalton, Lauff, Henke, Alt, & Li, 2013, Table 19).<sup>4</sup> Most bachelor's degrees awarded in the U.S. are actually in work-related fields of study. In 2012-13, business, education, and health professions together accounted for 35 percent of all bachelor's degrees. Adding other occupational majors such as engineering, law enforcement, and agriculture brings the total to 52 percent (U.S. Department of Education, 2014, Table 322.10).<sup>5</sup> Most baccalaureate students are pursuing practical purposes.

Although a large majority of high school students want to earn a bachelor's or advanced degree, in fact only about one-third are achieving that goal by age 30, and that number is increasing very slowly.<sup>6</sup> This creates a dilemma for high schools. If high schools try to respect students' aspirations by preparing all students *only* for four-year colleges and universities, many young people will finish their schooling without any technical knowledge or skill to earn a living (Rosenbaum, 2001; Schwartz, 2004). But if high schools limit access to the courses required for admission to four-year colleges only to students who around age 14 are deemed likely to succeed there, the high schools will mistakenly short-change many talented young people, including disproportionate numbers from low-income families, racial or linguistic minorities, or recent immigrants – an injustice to those students and a loss to society.

College and career pathways solve this dilemma by offering to prepare high school students for *both* employment *and* a full range of post-secondary educational options. Coursework required for four-year college admission is available to all students willing to put in the effort. If possible, students have access to college courses while still in high school. In addition, these same high school students also finish a rigorous sequence of career-technical coursework, so that no student leaves school without some knowledge and skill to earn a living. If possible, the CTE coursework leads to industry-recognized credentials, which help young people earn higher wages whether they enter full-time employment or work part-time while in college. And if students decide to enter a field different from the high school pathway they started in high school, it is not considered a failure because they have made the effort to learn something in high school, and have gained insight to discover their own path to productive adulthood.

Finally, pathways that combine career and college preparation are more likely to attract a cross-section of students who share an interest in the pathway theme, and may differ in demographic

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<sup>4</sup> Among seniors in 2004 who had taken no CTE courses in high school, the number expecting to earn bachelor's or advanced degrees was 79 percent.

<sup>5</sup> An additional 5 percent are in visual and performing arts, which could be considered occupational. The largest non-occupational majors are psychology, social sciences and history, which together account for 16 percent. Other non-occupational majors include mathematics and statistics, foreign languages, and liberal arts and sciences.

<sup>6</sup> Degree completion rates by age group are reported in the annual *Digest of Education Statistics*.

characteristics, prior academic achievement, and future occupational aspirations. This upholds traditional American democratic values. It also avoids the 20<sup>th</sup> century tendency to group lower-income high school students in work-related programs, while their more privileged peers are being prepared for postsecondary education. As noted below, part of the legacy from 20<sup>th</sup> century policies is that low-income students are still more likely to participate in CTE, though this difference has diminished since the 1980s. Enrolling a more representative cross-section of students in pathways will itself have the effect of improving the overall association between CTE participation and student outcomes.

## **EVIDENCE ON OUTCOMES FROM INTEGRATED CAREER AND COLLEGE PATHWAYS IN HIGH SCHOOL**

High school pathways that combine CTE with college-prep curriculum have been found effective in preparing students both for employment and for postsecondary education including baccalaureate programs. Evaluations of career academies provide the clearest evidence of benefits from combining an occupational course sequence with college-prep academic coursework (Stern, Dayton, & Raby, 2010). Several studies in the 1980s and 1990s found that career academy students had greater success in high school and beyond, compared to similar students from the same high schools. Career academy students generally showed relatively improved attendance, credits, and grades while in high school. One study found that career academy students from a large California district who entered a local university were more likely to complete their bachelor's degrees than other students from that same district (Maxwell, 2001).

Since students must apply to be part of a career academy, it is possible that academy students were more highly motivated to begin with, so their greater success might not all be attributable to the academy experience. To avoid this ambiguity, MDRC conducted a major evaluation in which students who applied to career academies were randomly assigned to enroll either in the career academy or in the regular high school program.

MDRC's study corroborated many of the earlier results. Notably, among students most at risk, 79 percent of academy students stayed in school through spring of senior year, compared to 68 percent of the control group. Eight years after high school, students assigned to academies had average monthly earnings of \$2,112, compared to \$1,896 for the control group (Kemple, 2008).<sup>7</sup> At the same time, MDRC found no significant differences in postsecondary educational attainment between the two groups, so the gain in earnings did not come at the cost of further education.<sup>8</sup>

A more recent, non-experimental study in California compared outcomes for students enrolled in California Partnership Academies (CPAs) with statewide outcomes for all public high schools

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<sup>7</sup> Amounts are in 2006 dollars.

<sup>8</sup> Eight years after scheduled high school completion, 50 percent of both the academy and control groups had completed a postsecondary degree or certificate, compared to 28 percent of graduates from urban, public, non-selective high schools in the NELS sample (Kemple, 2008, Exhibit 5). The numbers who had received bachelor's or higher degrees were 16 percent of the academy students, 18 percent of the control group, and 12 percent of the NELS urban sample.

(Dayton, Hester, & Stern, 2011). The study found that 95 percent of academy seniors in 2009-10 graduated at the end of the school year, compared with 85 percent of all California public high school seniors. Notably, among academy graduates, 57 percent reportedly completed the full set of courses required for admission to California State University or the University of California, compared to only 36 percent of graduates statewide. This last result demonstrates that career-themed pathways can in fact give students the option of completing the a-g sequence. Moreover, the law governing CPAs requires that at least half the students entering an academy in grade 10 must meet specified “at risk” criteria including low income, low grades and test scores, and a record of poor attendance — and a subsequent CCASN study confirmed that academy 10<sup>th</sup> and 11<sup>th</sup> graders generally do come from families with lower income and lower parental education, compared with non-academy students in the same high schools (Stern, Saroyan, & Hester, 2012). However, the positive outcomes for CPA seniors could be attributable in part to unmeasured characteristics such as motivation, persistence, or interest.<sup>9</sup>

An ongoing study of Linked Learning in California also has found positive results (Warner et al., 2015). A Linked Learning pathway embodies virtually the same combination of features as a career academy: an integrated sequence of CTE and college-prep academic coursework, along with work-based learning and student supports. The ongoing study is evaluating a multi-year effort to make these pathways available to all or most high school students in nine school districts. Compared to other students in the same districts, students in certified<sup>10</sup> Linked Learning pathways had significantly less likelihood of dropping out of high school, and correspondingly higher graduation rates. These findings are statistically and educationally significant, providing further evidence that pathways delivering this combination of features can produce benefits for students.

An important finding in recent research is that integrating CTE with academic instruction can improve students’ mastery of the academic subject matter (Stone and Lewis, 2014, especially chapter 4). Students tend to learn abstract academic skills and content better when they have to apply it in a context that means something to them. The curricular integration in college-and-career pathways is not just a way to deliver both academic and CTE coursework; it also facilitates more effective teaching and learning in the academic subjects themselves.

Work-based learning is a key element of California Partnership Academies, NAF academies, Linked Learning, and other pathways that also integrate academic and career-technical courses and content. No one knows how much the benefit to students in these pathways comes from the CTE itself, the integration with academics, the opportunity for work-based learning, the extra support for students to set goals and achieve them, or some combinations of these features. It would take an enormously expensive study, involving at least dozens of sites over at least 10 years, to get a conclusive answer. One recent attempt to answer the question points to work-based learning as a key feature: analyzing the MDRC data, Page (2012) found that the

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<sup>9</sup> Another CCASN study found that only 52 or 53 percent of the students entering a CPA in grade 10 eventually graduate from that same academy. Most of those who leave the academy remain in the same high school or another California public high school. See Stern, Saroyan, and Hester, (2013).

<sup>10</sup> “Certified” means a pathway successfully completed a review process developed by ConnectEd. The Linked Learning Alliance is now overseeing the pathway quality review process, and is redesigning it for wider use.

employment-related benefit for career academy students in that study was largely attributable to the sequence of work-based learning experiences provided by the academies.

Other studies of work-based learning – some in career academies, but mainly in other settings that do not have all the features of California Partnership Academies – have found that work-based learning can enable students to develop and exercise certain capabilities that they will likely use throughout their working lifetimes (Bailey, Hughes, & Moore, 2004; Zimmer-Gembeck & Mortimer, 2006). Such capabilities may include working with people of different ages and different degrees of authority; communicating with clients, customers, co-workers, and supervisors; and learning to solve problems involving work-related equipment, software, or systems for which co-workers and supervisors may or may not have solutions.

Recent research on early college high schools and dual enrollment is also relevant to the development of career-and-college pathways. Several studies have found that enabling students to take college courses while in high school increases high school graduation rates and completion of postsecondary programs (see Visher and Stern, 2015 for a brief summary). Some current initiatives, including the Pathways to Prosperity network<sup>11</sup> and the CCPT program, are combining the ideas of career academies and early college approaches in the design of pathways from high school to community college. Indeed, with the CCPT program California has joined with other states in the Pathways to Prosperity network.

In sum, a combination of features – an integrated sequence of CTE and academic coursework that may include courses for college credit, along with work-based learning and student supports – has been found effective in improving postsecondary educational and employment-related outcomes for students. Could a CTE sequence by itself produce similar benefits? If so, the other features may not be worth the effort and resources needed to implement them. Evidence on traditional vocational education in high schools in the 1980s and 1990s generally found less benefit for students than the benefit for students found in evaluations of academies or pathways that combined academic and vocational education with work-based learning and student supports. But in the 21<sup>st</sup> century, vocational education has become CTE, with a larger purpose. Evidence on outcomes from the new CTE is still limited, but some of it is more promising than findings from 20<sup>th</sup> century vocational education.

## **OUTCOMES OF HIGH SCHOOL VOCATIONAL EDUCATION AND CTE**

Studies of the labor market outcomes of high school vocational education in the 1980s and 1990s were usually limited to students who did not enroll in postsecondary education. Because the jobs and earnings of students who are employed while in college do not reflect their eventual labor market outcomes, including them in short-term studies of labor market outcomes would be misleading.

Looking at labor market outcomes a few years after high school, the 1980s and 1990s studies found that high school graduates who took more CTE courses in high school obtained higher

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<sup>11</sup> See <http://www.jff.org/initiatives/pathways-prosperity-network>

earnings, compared to other high school graduates who were not enrolled in postsecondary education. One of the most comprehensive studies was by Ferran Mane (1999), who used three national longitudinal surveys to analyze labor market outcomes for high school graduates from 1972, 1980, and 1992. He compared the degree to which the total number of vocational courses and the total number of academic courses were each related to number of months employed in the year following graduation, the hourly wage, and annual earnings. He found the number of vocational courses taken in high school was more positively related to these labor market outcomes than the number of academic courses. The difference was generally greater for graduates in 1980 and 1992 than in 1972.

It is difficult to make causal inferences about effects of high school vocational education or CTE because participation is correlated with both observed and unobserved characteristics of students. One attempt to finesse the selection issue did not yield clear results, but another did. The first attempt, by Altonji (1995), used the average number of courses in each subject taken by all students at a high school as an instrumental variable to predict the number of courses in that subject taken by each student at that high school. He also compared the results with ordinary least-squares regressions. The results using instrumental variables often differed from those using ordinary least-squares, which may indicate that selection bias really is a problem. Surprisingly, what stood out as the best predictor of both post-high school wages and college attendance was the number of courses a student took in foreign languages. No other academic or vocational subject had a consistently significant association with wages. Altonji surmised that foreign language courses may contribute to “general skill development,” or else the result may be due to omitted variables or sampling error. Unfortunately, the findings and discussion do not inspire much confidence in the possibility of reaching clear conclusions from correlational data about how much vocational or CTE classes cause increases in earnings.

In contrast, a recent study by Dougherty (2015) focused on Regional Vocational Technical Schools (RVTS) in Massachusetts. All students in an RVTS participate in CTE, alternating a week of CTE with a week of academic instruction. Students must apply for admission to RVTS. Admission is based on a score computed from middle school academic performance, attendance, and disciplinary records, plus a rating by a middle school counselor and an interview with RVTS administrators. It is likely that RVTS applicants differ from non-applicants on some non-observed characteristics, such as planfulness or motivation, that would have a positive influence on their success whether or not they participated in RVTS. Two of Dougherty’s methods — ordinary least-squares regression with statistical controls for observed variables, and a “coarsened matching” procedure — cannot control for unobserved variables.

Dougherty’s third method, a regression-discontinuity design applied to two RVTS that had more applicants than spaces, more effectively avoids differences in unobserved characteristics by comparing applicants who were just below the cut-off score for admission with applicants who were just above the cut-off and were therefore admitted to the two RVTS. This analysis found significant positive impacts of RVTS participation, including a 15 percent boost in the high school graduation rate, and a 13 percent increase in the likelihood of earning an employment-related certificate (Table 5). The regression-discontinuity results were sufficiently similar to the ordinary least-squares and coarsened matching results that Dougherty summarizes (2015, pp. 16-



17), “students who participate in an RVTS have better graduation and enrollment<sup>12</sup> outcomes, higher probabilities of earning industry-recognized credentials, and no difference in the probability of passing both exams required to earn a high school diploma than similar peers who do not attend these schools. The effects are largest for students from lower-income backgrounds,” who are disproportionately represented in RVTS.

Another recent study by Dougherty (2016), analyzed data from Arkansas, which has created a system that embodies the new CTE by requiring all students to take 6 career-focused courses in addition to an academic core. Twentieth century socioeconomic disparities between vocational and non-vocational students have virtually disappeared in the aggregate, but some disparities still appear in differential enrollment in different sectors. For example, Dougherty’s Appendix Table B-2 shows Finance has fewer low-income and African American students compared to Government and Public Administration – and on all outcome measures Finance students do better than students in Government and Public Administration. The report does not focus on the relation between student characteristics and outcomes by CTE sector. Instead it compares outcomes for CTE and non-CTE students, and appends some regression results. The key results are in Dougherty’s Figure 8, which shows CTE course-taking is positively related to the graduation rate, enrollment in 2-year college, employment after high school, and earnings after high school. These results show that incorporating CTE into the mainstream of the high school curriculum may produce positive outcomes for large numbers of students.

On the other hand, the Arkansas study also still suffers from the usual limitations of research on CTE. CTE and non-CTE students may differ in unmeasured characteristics like motivation, grit, ambition, or family support. The comparison of graduation rates does not correct for the fact that most CTE course-taking happens in grades 11 and 12, after many non-graduates have already dropped out. This is even more pertinent to Dougherty’s Figure 10, which shows a 21 percentage point difference in the graduation rate between concentrators and non-concentrators, but does not account for that fact that it would be hard for a student to become a concentrator until junior or senior year.

With regard to postsecondary educational attainment, four-year college outcomes are not shown in Dougherty’s figures. Multivariate regression results in his appendix tables B-4 through B-9 consistently fail to show any positive association between CTE and four-year college enrollment. The only significant associations are negative, particularly in B-9, showing concentrators who also took dual enrollment courses are less likely to enroll in 4-year college. Table B-10 uses a different procedure based on individual student matching, and loses about 1/3 of the students from the analysis, but finds a positive association between CTE concentration and 4-year college enrollment. Table B-11 shows students who took at least one CTE course are more likely to enroll in 4-year college than students who took none. Neither result is mentioned in the text of the report.

Recently the 2014 National Assessment of Career and Technical Education (NACTE)<sup>13</sup> (U.S. Department of Education, Office of Planning, Evaluation and Policy Development, Policy and Program Studies Service, 2014) analyzed the relationship between CTE course-taking in high

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<sup>12</sup> Students begin RVTS in grade 9. The enrollment outcome here is persistence to grade 10.

<sup>13</sup> Results summarized here are from Chapter 6, Student Outcomes.

school and several student outcomes. In general, the data from nationally representative surveys show lower academic outcomes for students who take more CTE courses. However, three quasi-experimental studies and one random-assignment evaluation that control for student characteristics found no consistent effect of CTE course taking on academic outcomes. Therefore, most of the negative association between CTE course taking and academic outcomes can be attributed to the fact that students who take more CTE courses on average come from less affluent families and have lower prior academic achievement.

NACTE described national trends in vocational and CTE participation. Comparing national surveys of high school transcripts in different years showed the following trends<sup>14</sup> in the percentage of high school graduates who:

	1982	1990	2000	2005	2009
Took at least one vocational or CTE credit	95	88	89	87	85
Took 3 or more vocational or CTE credits in the same occupational area (“concentrators”)	33	24	23	21	19

In 1982 vocational concentration was strongly skewed toward less affluent students, but this difference has diminished since then. The percentages of vocational or CTE concentrators (Dalton et al., 2013, Table 8)<sup>15</sup> among high school graduates from different socioeconomic and racial or ethnic groups were

	1982	1992	2004
Lowest socioeconomic quartile	40	31	21
Middle 2 socioeconomic quartiles	32	22	19
Highest socioeconomic quartile	15	10	12
Black	31	17	18
Hispanic	34	16	13
White	29	21	19

With regard to specific outcomes, NACTE (U.S. Department of Education, Office of Planning, Evaluation and Policy Development, Policy and Program Studies Service, 2014) found:

- Academic course taking increased for all students from 1990 to 2009, and the increase was greater among students who took more CTE courses, but the negative association between academic and CTE course taking remained large.** The 2009 National High School Transcript Study found 45 percent of graduates who completed 4 or more CTE courses also completed the coursework deemed necessary to qualify for a 4-year college, compared to 74 percent of graduates who took no CTE at all (Exhibit 6.1). Two studies that controlled statistically for student characteristics found either minimal or no relationship between academic and CTE course taking. A random-assignment study

<sup>14</sup> U.S. Department of Education, Office of Planning, Evaluation and Policy Development, Policy and Program Studies Service (2014), Exhibit 2.2 shows data for 1990, 2000, 2005, and 2009. Data for 1982 are from U.S. Department of Education, Office of the Under Secretary, Policy and Program Studies Service, *National Assessment of Vocational Education: Final Report to Congress* (Washington, 2004), p. 25.

<sup>15</sup> An example of how to read these percentages: in 1982, 40% of students from the lowest socioeconomic quartile of the high school population were vocational concentrators. Source note from Dalton et al. Table 8 says: U.S. Department of Education, National Center for Education Statistics, High School and Beyond Longitudinal Study of 1980 Sophomores (HS&B-So:80/82), "High School Transcript Study"; National Education Longitudinal Study of 1988 (NELS:88), "Second Follow-up, Transcript Survey, 1992"; and Education Longitudinal Study of 2002 (ELS:2002), "First Follow-up, High School Transcript Study, 2004."

in Philadelphia found students admitted to CTE high schools were more likely to complete a college-prep course sequence in math, but no difference in science or foreign language.

- **CTE concentrators score lower on academic achievement tests** than non-concentrators (Exhibit 6.2). For instance, 12<sup>th</sup> grade NAEP results in 2009 found 16 percent of CTE concentrators were proficient in math and 10 percent were proficient in science, compared to 31 and 24 percent of non-concentrators, respectively. Studies that use experimental or statistical methods to factor out the influence of student characteristics find little or no effect of CTE course taking on academic achievement test scores.
- **There is no clear association between CTE course taking and high school completion.** The fact that most CTE course taking occurs in grades 11 and 12 makes it difficult to study this relationship because a large proportion of students who drop out of high school do so in grade 9 or 10. The Philadelphia random-assignment study found higher graduation rates in CTE high schools, but studies that statistically controlled for student characteristics found mixed results.
- **CTE concentrators are less likely to participate in postsecondary education, and more likely to work for pay, compared to non-concentrators.** Two years after high school, the Education Longitudinal Study (ELS) found 70 percent of CTE concentrators had enrolled in postsecondary education, compared to 80 percent of non-concentrators (Exhibit 6.4). Correspondingly, 29 percent of concentrators had never enrolled but had worked for pay, compared with 18 percent of non-concentrators. The percentages varied by CTE field, with postsecondary enrollment rates highest among concentrators in information and health sciences, lowest in construction and transportation. Eight years after high school, 27 percent of CTE concentrators had earned a bachelor's or professional degree or certificate, compared to 39 percent of non-concentrators. On the other hand, 23 percent of CTE concentrators had earned a sub-baccalaureate degree or certificate, compared to 19 percent of non-concentrators (Exhibit 6.3). The Philadelphia random-assignment study found that attendance in CTE schools had a positive effect on postsecondary enrollment for some but not all cohorts. Other studies that controlled for student characteristics found mixed effects of high school CTE on postsecondary education.
- **Two years after high school, the ELS found 10 percent of CTE concentrators went on to postsecondary education in the same field as their high school concentration** (Exhibit 6.5). Again there was considerable variation among specialties, from 19 percent in health sciences to 5 percent in consumer and culinary services. Eight years after high school, 14 percent of CTE concentrators had completed a degree or certificate in the same field as their high school concentration, ranging from 40 percent in health sciences to 4 percent in agriculture and natural resources (Exhibit 6.6).
- **Among high school graduates who did not enroll in any postsecondary education within two years after high school, the ELS found 69 percent of CTE concentrators were working at least 35 hours a week, compared to 62 percent of non-concentrators, and the CTE concentrators earned an average of \$10.04 an hour compared to \$9.59 for non-concentrators** (Exhibit 6.7). **Eight years after high school,**

**among high school graduates with no postsecondary education the CTE concentrators still earned \$0.89 an hour more than non-concentrators** (Exhibit 6.10). Among high school graduates who earned an undergraduate certificate the CTE concentrators earned \$1.30 more than non-concentrators. Somewhat surprisingly, among those with associate's degrees CTE concentrators earned \$0.28 *less* than non-concentrators. High school CTE concentrators earned \$0.31 more than non-concentrators among those who had completed a bachelor's degree eight years after high school, and \$0.77 less among those who had completed a professional degree or certificate. **Most of these wage differences between high school CTE concentrators and non-concentrators were too small to be statistically significant. The differences by level of postsecondary attainment were substantially bigger: average hourly wages were \$13.89 for graduates with no postsecondary education, \$16.14 with an associate's degree, \$18.87 with a bachelor's, and \$22.94 with a professional degree or certificate.**

In California the best information on outcomes of high school CTE come from a series of studies conducted for the California Department of Education (Mitchell, 2004, 2006; Mitchell, Adler, & Walker, 2011). The first two studies focused on students in Regional Occupational Centers and Programs (ROCP). The 2004 report used 2001-2 data on 11<sup>th</sup> and 12<sup>th</sup> graders enrolled at 21 ROCPs programs that volunteered to provide information on students "who were not in University of California a-g course track and were not in Special Day Classes" (p. 3). A comparison group of students at the same high schools, also not in Special Day classes or on track to meet a-g requirements, was chosen to "match ROCP students with regard to gender, age, ethnicity, socio-economic status, English language fluency, prior school attendance and 10<sup>th</sup> grade high school grade point averages" (p. 3). The 2006 report used 2003-4 data on 11<sup>th</sup> and 12<sup>th</sup> graders enrolled at 28 ROCPs programs that volunteered to provide information on students "who were not in the University of California a-g course track and were not in Special Day Classes" (p. 4). A comparison group was selected using the same criteria as in the 2004 study. The 2006 report notes that the comparison students were "higher performing and more socio-economically advantaged" than the ROCP students (p. 4).

The 2010 study (Mitchell et al., 2011) used a different approach. Instead of drawing data from ROCP programs that agreed to participate, it used CDE data files to draw a sample of 5,535 CTE students from the graduating class of 2009 in 116 high schools. CTE students were defined as having completed a sequence of CTE courses, which could have consisted entirely of ROCP courses or could also have included some CTE courses offered by the high school. Unlike the 2004 and 2006 studies, the 2010 study did not construct a comparison group.

As in the data from national surveys analyzed by NACTE, the results of these studies mainly reflect the characteristics of CTE students rather than the actual effect of CTE programs.

Findings on key outcomes include:

- **Attendance.** The 2004 study (p. 15) found that days absent increased from grade 10 to grade 12 for both the ROCP and comparison groups, but the increase was smaller for the ROCP students (4.92 to 8.54 days per year) than for the comparison group (4.21 to 9.04). Relative to the comparison group, the ROCP students' attendance improved by 1.21 days per year. The 2006 report found (p. 22) a similar pattern: the average number of days

absent for the ROCP students increased from 5.05 in grade 10 to 9.03 in grade 12. For the comparison group the increase was from 4.37 to 8.59. The ROCP students had more days absent each year, but over these 2 years the difference narrowed by 0.25 days – the equivalent of 1 or 2 class periods over the course of a year. The 2010 study of CTE students also found the average number of days absent increased from grade 10 through 12 (p. 88).

- **Grades.** The 2004 and 2006 studies both found that ROCP students had lower GPAs than the comparison students. In the 2004 study ROCP and comparison groups had GPAs of 2.51 and 2.72, respectively, in grade 10, and 2.80 and 3.26 in grade 12, so the difference increased over these two years. The 2006 study did find larger GPA gains from grades 10-12 for the ROCP sample (0.33 gain) than the comparison group (0.23). The 2006 report does not provide any information about differences in GPA between CTE and non-CTE courses, but the 2010 study found grades in CTE classes are higher on average. Since the 2006 comparison group took fewer CTE classes, it is possible that the 0.1 difference in GPA gain between the two groups could be due to higher grades in ROCP classes. The 2010 report did not have a comparison group, but as in the other studies it found improvement in overall GPA from grade 10 to 12 for CTE students. However, students who took more CTE classes showed less improvement in GPA (p. 47), despite the fact that average GPA in CTE classes was 3.17 and average overall GPA is 2.4. This implies that taking more than 2 or 3 CTE classes would be associated with a decline in grades in non-CTE subjects.
- **Completion of a-g courses.** The 2004 and 2006 studies explicitly focused on students who were not on track to complete the a-g sequence, and did not report on a-g course completion. The 2010 study found a 17.6 percent a-g completion rate for the CTE students who graduated in 2009 (p. 51). This was half the 35 percent statewide a-g completion rate for 2009 graduates shown by Dataquest.
- **Graduation rate.** The 2004 and 2006 studies did not report high school graduation rates. The 2010 study found 89 percent of the 2009 CTE seniors graduated. Dataquest for 2008-09 shows a senior graduation rate of 80 percent statewide. However, it is difficult to compare the CTE number with the statewide number, because 18 percent of the 2009 CTE seniors were actually 2008 seniors who "had officially graduated in 2008" but came back for another year (p. 40). Dataquest does not indicate whether statewide grade 12 enrollment in 2008-09 also included students who had officially graduated in the previous year.
- **Postsecondary education.** In the 2004 and 2006 studies, both the ROCP sample and the comparison group included only students who were "not in the a-g course track." In spite of that, the follow-up survey in 2004 found 25 percent of the comparison group and 21 percent of the ROCP graduates were enrolled in four-year colleges (p. 24). An additional 52 percent of comparison students and 51 percent of ROCP graduates were in community college. In contrast, the 2006 follow-up survey found (p. 31) the percentage of students in 4-year colleges or universities was more than twice as high for the comparison group (35.6%) than for the ROCP students (16.5%). Community college participation was 51 percent for the ROCP students, 46.3 percent for the comparison group. The 2010 study, which did not have a comparison group, found in the follow-up survey 17 percent of CTE

graduates in four-year colleges, and 50 percent in community college; these numbers are very close to those for ROCP graduates in the 2006 report.

- **Postsecondary employment.** Consistent with previous research on high school vocational education and CTE, the 2004 and 2006 studies found that ROCP students were more successful in the labor market than comparison students in the first year after high school. For instance, the 2004 study found ROCP graduates earned \$10.39 on average, while the comparison group earned \$7.99 (p. 19). In the 2006 study, ROCP graduates were earning \$9.85 an hour, and comparison students were earning \$8.28 (p. 25). The 2010 study found CTE graduates earning an average \$9.87 an hour when surveyed a few months after graduating.

Again, these findings reveal more about which students enroll in CTE than about the effects of CTE on students. Still, they do not support a claim that the benefits of CTE by itself are just as great as the benefits of a pathway that combines CTE with academics, work-based learning, and student supports. Instead, recent evidence continues to support a policy of encouraging high schools to provide pathways with other features in addition to a CTE sequence.

## **AN OPPORTUNITY TO LEARN**

California high schools and community colleges have been given substantial funding to design and build various kinds of career pathways. This provides a unique learning opportunity for California educators, employers, and other stakeholders. What kind of effort does it take to organize and implement high school pathways that provide direct links to community college and also provide the a-g coursework necessary for enrolling directly in CSU or UC after graduation? What kinds of work-based learning opportunities can be offered to large numbers of students? How can local and state data systems be modified so that educators, employers, and all other stakeholders can start to learn whether different kinds of pathways are leading students to destinations that are quite similar or very different? Unless and until new data proves otherwise, the existing evidence indicates that California high schools will benefit most from pathways that combine CTE with a-g coursework, dual enrollment, work-based learning, and student supports.

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