College and Career Ready: A Conceptual Framework for Increasing Engagement, Achievement and Transition

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College and career readiness (CCR) is a phrase that has captured the imagination if not the vocabulary of state and federal policy makers in the United States. What it means, however, is subject to a great deal of variance in interpretation. And definitions matter when it comes to policy. The basic college and career ready question is, what is the appropriate mix of academic skills, generalizable occupational skills, and specific technical skills required for the emerging labor market. A second level question is, how can schools help students develop these skills.

In this paper, I intend to address these two questions from four perspectives. I will begin with a discussion of the elements required for developing a college and career ready secondary school graduate; strategies for developing those skills; systems that are evolving the United States through which these skills can be developed and conclude with a brief look at the role of career guidance in supporting the college and career ready efforts.

Elements of College and Career Ready

Most of the reports and policy papers addressing this topic equate career ready with college ready. The American Diploma Project (Achieve, 2004, 2010) has defined college and career ready with sets of benchmarks for English and mathematics that all students should reach to receive a diploma. The National Center on Education and the Economy (2007) has stated that the goal of high school should be to prepare all students to do college-level work without the need for remediation. The means proposed for ensuring such preparation would of Boards of Examination in each state that would develop syllabi of core subjects and examinations to assess competence in these subjects.

Thus the means recommended to prepare college ready graduates are high standards and expectations, rigorous courses aligned with standards, and tests to ensure that students meet those standards. Presumably, career-readiness comes with the same requirements. The evidence contradicts the rhetoric, however. Paul Barton (2006) at ETS, Peter Cappelli (2008) at the Wharton School, and other labor market experts argue that being prepared for college is not the same as being prepared for successful transition into the workforce. Indeed, the many simplistic definitions supported by various advocacy groups fail to accommodate the varied nature of the workplace and the different kinds of academic preparation required for successful entry. Put another way, the math skills required for entry into an engineering career pathway are different from those required in a social services career pathway. Still these may be different from those math skills required to function as a citizen in consumer-driven economy.

Defining College and Career Ready

Perhaps we ought to consider an alternative framework that more clearly defines what college and career ready means. To be career ready, a graduate must have mastery of three kinds of skills, not just one. First and most obviously, academic knowledge is important—especially the occupational expression of academic knowledge; graduates should know how to use mathematics or science to solve real workplace problems, for example. Second, employability skills—often called soft skills—apply to all workplaces and include such personal qualities as responsibility, self-management, and integrity. Third, technical skills are unique to specific occupational areas, although for many students, instruction in a specific occupational context offers opportunities to develop all three types of skills.

Figure 1 presents a concept of college or work and career ready, which includes employability, and technical skills. Education is, of course, primarily academics, and a sound base of academic skills is essential to all functioning in a complex, rapidly changing world. To be career ready, however, an individual must also have employability skills and the technical skills and knowledge required for specific occupations. The overlap of the circles indicates that the three types of skills build upon each other, and the non-overlapping sectors signify the unique contribution of each set. It is the overlap or the intersection of these three domains of knowledge that point to the potential for CTE to add value to the high school experience of many youth. Academic skills are expressed in the acquisition of technical as well as occupational or employability skills.

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Insert Figure 1 about here

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Academic Skills Required for College and Career Ready

It has widely been reported that, on average, U.S. school children perform less well academically than their peers in most other advanced nations. The National Assessment of Educational Progress, shows little progress, and in some cases, declines in reading skills and science knowledge of U.S. high school students during the past two decades; math skills have remained essentially static. These dismal results come despite an increase from an average of roughly 13 academic credits earned by high school graduates in the early 1980s to nearly 20 today. These data suggest that piling on more course requirements is not getting us where we want to be. An alternative to simply adding more academics to the curriculum is to leverage the potential of curriculum integration to enhance the underlying academic content in occupational coursework.

While there a many academic skills needed or useful in the workplace, perhaps literacy and mathematics are the most critical. For the purpose of this discussion, I will focus on mathematics in part because it is the most remediated subject and the one that troubles more students.

Findings about the workplace needs for mathematics have had little impact on the push for more academics. Reports such as The Toolbox Revisted (Adelman, 2006) and Ready or Not: Achieving a High School Diploma that Counts (American Diploma Project, 2004)) have succeeded in equating studying mathematics at the algebra II level and above with increased postsecondary success. Achieve Inc. examined a small selection of technical occupations (e.g., aircraft maintenance technician) and highlighted what it identified as higher level math embedded in its American Diploma Project (Achieve, Inc., 2008). But how much mathematics do most jobs really require? A survey of 2,300 workers found that virtually all, 94%, used basic arithmetic, but only 22% reported using anything more advanced (Handel, 2007). When the respondents to this survey are limited to upper-level white collar workers, only 30% reported using algebra. Carnavale and Desrochers (2003) reported an analysis of the mathematics needed for different job levels using the paradigm developed for the National Adult Literacy Survey. Workers in higher paying jobs have taken more advanced mathematics. Nevertheless, they note:

Clearly, algebra II is the threshold mathematics course taken by people who eventually get good jobs in the top half of the earnings distribution. And the more mathematics beyond algebra II, the better the odds of eventually landing a job in the top 25 percent of the earnings distribution. Yet even a casual analysis of the distribution of occupations demonstrates that relatively few of us—fewer than 5 percent—make extensive use of geometry, algebra II, trigonometry, or calculus on the job. (p. 26)

Carnavale and Desrochers (2003) also discuss the mismatch between the mathematics that students learn in school and what they will eventually need on the job:

Mathematical skills are the best general proxy for demonstrating the increasing economic returns to reasoning ability in the new economy. It is much less clear, however, that the content and methods of the current mathematics curriculum are aligned with the uses of mathematics in the world of work. Most Americans seem to have taken too little, too much, or the wrong kind of mathematics. Too many people do not have enough basic mathematical literacy to make a decent living even while many more people take courses in high school such as geometry, algebra, and calculus than ever will actually use the mathematical procedures taught in these courses. (p. 25)

Studying mathematics does not impart the skills that are rewarded in the new economy so much as it identifies those who have these skills. There is no question that students who earn high school credits in trigonometry, pre-calculus, and calculus are more likely to obtain postsecondary degrees. To assume, however, that requiring more such courses will lead to more college graduates confuses cause and effect. It is not these courses, by themselves, that improve the likelihood of obtaining degrees. Students who succeed in advanced mathematics have a combination of skills, knowledge, and motivation that enables them to do well in school. Simply requiring students to take more higher-level courses will have little impact on the characteristics that produce this success. The more likely result of higher requirements is more dropouts.

As noted earlier, ACT (2006) is the primary source for the claim that college ready and career ready require the same types of skills. Their analysis focused on Zone 3 occupations as defined in the O*Net data generated by the U.S. Department of Labor. Zone 3 occupations pay a family sustaining wage but do not require a four-year college degree. Assuming the validity of their analysis, an examination of the tables in the ACT report is revealing. Mapping these skills against math course content in two states (California and Oklahoma) shows that algebra I is the highest level of math required to address these skills. The separate list of statistical thinking also fit within algebra I or pre-algebra coursework. The short list of geometry concepts similarly were found in a single high school geometry course.

One can conclude from this analysis that the math requirements for college in career ready can be met with at most, two years of high school math. This is consistent with the National Center on Education and the Economy's Board Examination System a number of states have signed onto. This, of course, runs counter to the many states that now require algebra II or more for high school graduation.

In addition to the kinds of math skills detailed above, the emerging workplace, and indeed society as a whole, requires that our schools help students to think like scientists. More than memorizing periodic tables or plant classifications, the 21st century workplace and society more generally require citizens with the ability to confront problems as a scientist does: formulate a hypothesis, gather relevant data, analyze the data, and draw conclusions. This requires instruction that makes explicit the connections among scientific concepts and principles by applying the concepts to real problems. Current research by the NRCCTE is testing a curriculum integration approach intended to build these skills through CTE programs. Findings are expected this Spring.

Employability Skills

As one examines what employers want from their employees, it is clear that many opportunities are available to non-college degreed youth if they possess the proper skills and training that could be provided by secondary CTE programs and postsecondary CTE programs both for the degree and certificate programs. Barton (2005) and Mathematica Policy Research, (2002) conclude that employers place a higher premium on hiring individuals who show good work habits, confidence and leadership skills – often described as "soft skills." These are skill sets that are often lacking in many youth; yet are

the kinds of skills that are the focus of quality high school CTE programs and pedagogy. Soft skills, unlike technical skills tend to be common across all workplaces.

Employability skills are often referred to by the SCANS acronym shown in Figure 1. The acronym "SCANS" is derived from the Secretary's Commission on Achieving Necessary Skills (1991). The secretary referred to is U.S. Secretary of Laborwho appointed a commission that identified generic competencies needed in all jobs and what the commission labeled "foundation" skills that underlie these competencies. The foundation skills include basic academic skills, thinking skills (e.g., creative thinking, problem solving) and personal qualities (e.g., responsibility, self-management, integrity/honesty). It is these personal qualities that are most often thought of as employability skills.
The 21st century skills noted in Figure 1 are to a large degree an updating and elaboration of SCANS (Partnership for 21st Century Skills, 2009). As with SCANS, the base is academic skills. Woven through the teaching of all core subjects are five "21st century interdisciplinary themes:"

- Global awareness
- Financial, economic, business and entrepreneurial literacy
- Civic literacy
- Health literacy
- Environmental literacy

Building on this base are three sets of additional skills: (1) learning and innovation, (2) life and career, and (3) information, media, and technology.

The Labor Market Challenge

"High-skill, high-wage, high-demand occupations" is the rhetoric most often employed when describing the aim of workforce development, not only for Perkins-funded programs, but also for many high school reform efforts. The assumption is that all other occupations are "low skill, low wage."

Phrases like "high-skill, high-wage" conjure up visions of technology-driven occupations that demand baccalaureate degrees or higher, intensive mathematics preparation, and the like. In reality, many states define a high-skill occupation as a job requiring any post-high school education; this may include anything from related work experience to a doctorate. High wage is defined as anything above the median for all occupations. This means jobs that may pay between $30,000 and $40,000 per year are considered high wage. In short, the phrase "high-skill, high-wage" tends to blur important distinctions in the labor market, distinctions that especially matter when thinking about potential foci for CTE programs.

Labor market economists argue that it is difficult to fit occupations into a few skill categories, but most will agree that there are at least three, not two (Holzer & Lerman, 2009). In this schema, high-skill occupations are those in the professional/technical and managerial categories. Low-skill occupations are in the traditional, in-person service and agricultural categories. The rest are middle skill occupations. As labor market economists define them, middle skill occupations have three important characteristics:

1. They require education or training beyond the high school diploma, but less than a bachelor's degree. This includes associate's degrees, vocational certificates and diplomas, significant on-the-job training, apprenticeships, previous work experience or some college (Council on Competitiveness, 2008).
2. They are not easily outsourced (Kaleba & Mayo, 2008). By contrast, high skilled-professional occupations are increasingly being outsourced along with low-skilled and routinized production jobs. Sarosh Kuruvilla of Cornell University's Industrial and Labor Relations School has noted that, "Not only are well-paid jobs moving from Wall Street to Bangalore, but medical research jobs, including those in radiology, drug discovery and testing, and

clinical trials, also are moving to India" (as quoted in Crawford, 2007). According to Kuruvilla, highly skilled U.S. occupations in several other industries also are being outsourced. "These industries include engineering services -- for a number of different industries, but particularly in aerospace and civil aviation -- software research and development, and in animation."

3. And, they are projected to provide the largest number of total job openings through 2016 (Farr & Shatkin, 2006).

It is this last point that generates a lot of confusion. The U.S. Bureau of Labor Statistics provides many kinds of analyses of labor market trends. Its most-cited statistic is "fastest growing occupations." Many highly skilled occupations are among the fastest growing. The challenge in focusing on this statistic is that it depends on the denominator. That is, if there are 100 people working today in Occupation A and projected growth will add 50 people to that total, we may say that Occupation A's growth rate is 50%. If Occupation B currently employs 1,000 people and is expected to add 100 more, its growth rate is only 10%—but it is adding double the number of new jobs as Occupation A. This second statistic—actual projected job openings—is the most useful when thinking about the future workplace and its implications for CTE and workforce development.

For example, employment for biomedical engineers, a highly skilled occupation, is projected to grow by 72% in the next decade, an extraordinary rate of increase. However, that translates into approximately 12,000 new jobs. By contrast, the job of medical assistant—a middle skill occupation—is expected to grow by a more modest 34%, but it will add approximately 164,000 new jobs.

As the demand for middle skill workers increases, wages in this category are also likely to increase subject to credentials earned and skill levels (Holzer & Lerman, 2009). For example, healthcare workers at the middle skill level who hold certificates and associate's degrees currently earn a median hourly wage of $27.20. These wages are compared with the national median hourly wage of $15.57, the default definition of high wage in many states and the national median wage for all jobs. In short, many middle skill occupations pay high wages (Farr & Shatkin, 2006).

Signaling the Labor Market

One explanation for the nation's "college for all" emphasis is that a college degree has become a proxy for employability or work readiness (Stone & Alfeld, 2006). Believing that the high school diploma no longer signifies meaningful achievement, and lacking a national system of industry credentials, employers rely on college degrees. Recent national data indicate that there have been increases in college enrollment and completion since the early 1970s, the ramifications of which are still unclear. As noted earlier, Rosenbaum (2002) found that only 42% of U.S. high school graduates complete and graduate from college within 10 years of leaving high school. Other studies put the success rate much lower, with less than 20% of all students completing a four-year degree within six years (National Center for Public Policy and Higher Education, 2004). Regardless, such degrees are coming at increased costs to students and their families. The Public Interest Research Group (Swarthout, 2006) found that more than two-thirds of college graduates leave with debt and between 23% and 55% of new graduates leave with debts described as unmanageable.

Labor market trends indicate that many opportunities are available to non-college degreed youth if they possess the kinds of skills and training provided by secondary CTE programs and postsecondary CTE degree and certificate programs. Stone and Alfeld (2006) defined the basic skills for success in the modern workplace as 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 at levels much higher than today's high school graduates, the ability to work in groups, the ability to

make effective oral and written presentations, and the ability to use personal computers to carry out simple tasks. Other reports (Barton, 2005; Mathematica Policy Research, Inc., 2002) concluded that employers place a higher premium on hiring individuals who show good work habits, confidence, and leadership skills—the so-called "soft skills." Many of these skills can be developed through classroom- and work-based CTE experiences.

In an NRCCTE study, Bartlett (2004) conducted what to our knowledge is the only systematic test of the signaling value of industry-recognized certificates. His analyses of the signaling power of the two educational qualifications found a uniform preference for the associate degree regardless of work experience in the information technology sample. Interviews with the managers found that many in information technology believed the associate degree indicated a broader, more complete understanding of the field, and some expressed doubts about the rigor of the A+ test. Even though Bartlett studied only two industry recognized credentials, it is clear that their signaling value varies across employers and is influenced by the factors, including testing, underlying certification.
Because the labor market in the United States is not well organized with respect to qualification, the challenge is to identify signals beyond formal education that the labor market will recognize. These signals would be based on certifying skill attainment. Stone (2009) identified definitional, measurement and timing issues related to assessing technical skills. Several states are addressing these issues from different perspectives. Some are using industry-driven approaches. CISCO certification in IT and Certified Nursing Assistant in health care have been adopted by many states. A number of states are creating their own employability certifications. The extent to which industry recognizes these as a signal is unclear.

The Education Challenge

Much of the work of the current National Research Center has focused on three of the major components of high school reform that CTE is particularly well-suited to provide: student ***engagement*** (reducing dropout and increasing school completion), strengthening ***achievement*** (technical and academic), and ***transition*** (both from high school to postsecondary and from education to employment). Engagement, achievement, and transition provide a framework for translating understanding and measuring the impact of rigor, relevance, and relationships.

For students, staying engaged in high school is a necessary but not sufficient condition for reaching a level of achievement that will allow them to transition to postsecondary education and employment. One measure of ***engagement*** is graduating from high school on time. Another closely related measure is dropout rates. Both are key indicators of high school performance, and graduation rate is a component of adequate yearly progress as required under NCLB. There are also other ways to measure student engagement through behavioral and affective components. DeLuca, Plank, and Estacion (2006) identified effort in school, cutting classes, discipline problems, probation, and absences as commonly used indicators.

Achievement has been the critical focus of high school studies and is the primary focus of NCLB. In fact, most reform efforts aim expressly to increase achievement among students. While engagement efforts deal with the objective of keeping students in high school, achievement addresses how well students perform while there. Achievement is most often measured by test scores, but coursetaking patterns, grade point averages, and other data points are sometimes used. As in the case of engagement, achievement has received attention from different educational stakeholders with different agendas. The National School Alliance, in its *A Call to Action* report, includes achievement as one of the core goals needed to transform high schools (National High School Alliance, 2005). More specifically related to CTE, the Association for Career and Technical Education (2006) indicated the need to "support students in the acquisition of

rigorous core knowledge, skills, habits, and attitudes" (p. 4). Jobs for the Future (2005) indicated that one way to take advantage of today's best innovations and to rebuild and extend the education pipeline for tomorrow's needs is through the creation and support of "rigorous, high-performing learning institutions that enable young people and adults to achieve at high levels" (p. 4). The American Youth Policy Forum stated that "improving student achievement and outcomes is obviously a priority for anyone involved in high school reform. Little by little, the public, policymakers, and educators have acknowledged the problems of academic performance of high schools" (Brand, 2004).

Achievement in traditional academic subjects is deemed critical to postsecondary education (Greene & Forster, 2003) and the workplace (ACTE, 2006). Jobs for the Future (2005) concluded that the nation must take two approaches to meet the nation's future education and economic needs. First, we must create rigorous, high-performing learning institutions that will enable young people and adults to achieve at high levels and rapidly earn postsecondary credentials. Second, we must create a workforce preparation system that will provide the skilled workforce needed for today and tomorrow's workplaces.

High school achievement is critical for postsecondary education because it helps reduce the high proportion of students taking remedial courses, and because the same kinds of skills are essential for the workplace. "ACT research shows that far too few members of the graduating class of 2004 are ready for college-level work in English, math, or science—or for the workplace, where the same skills are now being expected of those who do not attend college" (ACT, Inc., 2007). It has become clear that for ***transition***—either to postsecondary education or to the workplace—the required level of achievement has changed for everyone, and that requires changes in *what* students learn in high school and, more importantly, *how* students learn in school. The National Council of Teachers of Mathematics (NCTM, 2000) issued a report that emphasized math as one of the *new basic skills* for industry, arguing that mathematics is no longer a requirement only for prospective scientists and engineers. "Instead, some degree of mathematical literacy is required of anyone entering a workplace or seeking advancement in a career" (Stone, Alfeld, Pearson, Lewis, & Jensen, 2006, p. 1).

Strategies for Increasing Engagement, Achievement and Transition: Keys to the College and Career Readiness Agenda

To master these kinds of skills and successfully transition into adulthood, youth must be engaged in learning and achieve in demonstrable ways. A necessary first condition to successful transition to adulthood is a successful high school experience. Research from Johns Hopkins University and the National Research Center for Career and Technical Education (NRCCTE) has shown that participation in career and technical education (CTE) increases the likelihood of completing high school, especially for students who enter high school with lower measured academic ability (Plank, DeLuca, & Estacion, 2005; Castellano, et al. 2007). Plank and his colleagues found a ratio of one CTE class for every two core academic classes increased the chances students would graduate. More recent analysis from the NRCCTE shows that CTE majors are more likely to survive and finish high school (see Table 1).

CTE participation has other benefits. The workplace of the 21st century, experts argue, requires that all workers be able to communicate with co-workers and customers, collaborate in evolving work-teams, think critically and solve problems, and demonstrate creativity and innovation. If one of the goals of education is to prepare young people with these employability skills, where in the high school curriculum can they be developed? Two pedagogic opportunities are readily available in all quality CTE programs: CTE student organizations (CTSOs) and work-based learning (WBL).

CTSOs like SkillsUSA, DECA, FBLA, HOSA, and others provide participants with opportunities to develop the kinds of non-academic, employability skills called for in the SCANS and 21st-Century Skills

reports. Research from the NRCCTE has shown that key elements of CTSOs are linked to increased academic engagement, employment and college aspirations, and career self-efficacy (Alfeld, et al., 2007).

Our counterparts in Europe have long understood the value of WBL. The Organization for Economic Cooperation and Development (OECD, 2010) conducted an extensive analysis of vocational education and training (VET; the European equivalent of CTE) in its member countries. The cross-country synthesis of these studies showed that WBL-intensive approaches are especially effective in meeting the developmental needs of youth and in preparing them for advanced studies in polytechnics and applied science university programs. High-quality CTE programs in the United States have shown similar results.

A more dynamic vision of college- and career-readiness focuses on the many students who are often bored and frustrated in the increasingly narrow curriculum being offered in U.S. high schools. CTE that emphasizes academics and engages students in intensive WBL experiences can keep students in school, teach them academic skills they will actually use in the workplace, and contribute to their successful acquisition of postsecondary credentials.

To those who would label such a vision "tracking," we suggest that most pernicious track we offer young people today is the dropout track. A high quality, technically and academically rigorous career pathway that employs the proven pedagogic strategies of an integrated curriculum, CTSOs, and intensive WBL are what our students, our schools, and our economy need.

As discussed earlier, academic skills have an expression in the workplace. The issue is what skills are necessary for the workplace that are also necessary for successful college transition and success. We turn to an examination of mathematics as it represents a key sorting mechanism for higher education, especially for STEM occupations.

Curriculum Integration

In Figure 1, Math-in-CTE is an example of the technical expression of academic knowledge. Math-in-CTE refers to an experiment conducted by the National Research Center for Career and Technical Education that tested the effects of enhanced mathematics instruction in five occupational areas (Stone, Alfeld, & Pearson, 2008). Teaching academics in occupational context is what research shows will improve the learning of those students who struggle in academic courses. Students who struggle in core subjects are typically assigned to drill and practice courses and tutoring that involve more of the same type of instruction that has served them poorly throughout their education.

The intervention that the experimental students received consisted, on average, of 20 hours of math-enhanced instruction delivered at appropriate times during the school year. Each teacher within an occupational area was free to choose when he or she would teach each lesson, and all lessons were taught by the CTE teachers alone. The intervention did not involve team teaching.
Even though the experimental students received an average of only 20 hours of enhanced math instruction, these lessons produced a significant effect. The experimental students scored 9% higher than the control students on the TerraNova posttest, and 8% higher on Accuplacer[6]. They also scored higher on WorkKeys, but the difference was not statistically significant. The 20 hours of enhanced math represented just 11% of a one-hour class taught for the typical 180 days of a school year. And not all of this time was spent on math, because the math was taught in the occupational context in which it naturally occurred. If the academics inherent in all occupational contexts had received the type of explicit instruction that occurred in one course in the Math-in-CTE study, the tested academic skills of CTE students who received such instruction would almost certainly have exceeded students without academic enhancement by even more.

Work-Based Learning

Most high school instruction is still based on the behaviorist assumption that knowledge can be taught independent of context and that such learning can be evaluated using non-authentic/non-performance methods. Modern cognitive science research finds the opposite. As Grabinger (1996) points out, "knowledge learned but not explicitly related to relevant problem solving situations remains mostly inert, meaning the learner is unable to use it for anything practical when the opportunity arises and thus such knowledge quickly disappears." Algebra, for example, is a mathematical procedure for solving many practical problems but is taught and evaluated in a non-contextual abstract form. One of the "quiet" equity issues in U.S. schools is that classes taught in these decontextualized abstract modalities are effective only for a relatively small number of intellectually blessed students. For most students, skills and knowledge are best learned within realistic contexts where students have the opportunity to practice and master outcomes that are expected of them.

The debate over costs and benefits and adolescent employment has raged for some time. Stone (2011) summarized these and discussed the many issues attendant to the marked decline of youth working in the United States. The key in making work benefit youth is in linking it to education.
The OECD (2010) report Learning for Jobs shows that beyond smoothing the transition from school to the workplace, work-based learning (WBL) offers a powerful tool for increasing more transferrable soft skills critical to workplace success and largely ignored in more conventional school-based learning. Studies of employer preferences here and elsewhere in the world show they strongly value soft skills such as the ability to work in teams, communication skills, problem-solving, entrepreneurship and work discipline. But perhaps the most important value work-based learning provides is the opportunity to increase the basic literacy and numeracy skills learnt in a practical environment, an appealing alternative to the many youth not inclined toward the more abstract pedagogies commonly used in school-based learning. In an analysis of over 37,000 students enrolled in High-Schools-that-Work sites, Bottoms, Han & Murray (2008) found high quality CTE and WBL linked to improved reading scores. Finally, and perhaps most germane to the education debates in the United States, research by Bishop and Mane (2004) and others shows that countries where high percentages of youth engage in intensive CTE and WBL, such as apprenticeship, perform better on traditional academic achievement outcomes (e.g., school completion, tertiary education, reading and math literacy) than in nations where such participation is low, like the United States.

There is also evidence on the effect of WBL on higher education participation and success. Swail and Kampits (2004) found that students who participate in a high school work-based learning activities achieve at the four-year postsecondary level as well or better than students who do not participate in these activities. Further, their finding that WBLstudents (defined by those who participate in two or more WBL activities) enroll at the postsecondary level and do as well as other students has implications for admissions and recruitment practices. They also found that almost three-quarters of all postsecondary students believed they learn better through hands-on projects. This is precisely the kind of experience provided by WBL.

Today's high schools have several WBL pedagogies they could employ. These include:

- Cooperative education is a structured method of instruction whereby students alternate or coordinate their high school or postsecondary studies with a job in a field related to their academic or occupational objectives. Written training and evaluation plans guide the instruction, and students receive course credit for both their work and classroom experiences.
- Job shadowing is a career exploration activity for middle school and early high school students. Students follow an employee in a work setting for one or more days to learn about a particular occupation or industry.

- Workplace mentoring includes instruction in general workplace competencies, including development of positive work attitudes and employability skills. It includes broad instruction, to the extent practicable, in all aspects of the industry.
- School-based enterprises are enterprises in which goods or services are produced by students as part of their school program. Stern, Stone, Hopkins, McMillion, and Crain (1994) refined this definition by focusing on production of goods and services for sale to or use by people other than the students involved.
- Internships are situations where students work for a specified period of time for an employer to learn about a particular industry or occupation. Workplace activities may include sample tasks across different business units or may focus on special projects or on a single occupation. Internships may or may not include financial compensation.
- Apprenticeships. Registered apprenticeships are contracts between an employer and employee during which the paid worker, or apprentice, learns an occupation in a structured program. Many apprenticeships are jointly sponsored by employers and labor unions. The contract specifies increasing wage levels as the apprentice learns additional skills. Youth apprenticeships are typically multiyear combinations of school- and work-based learning in a specific occupational cluster designed to lead directly into either a related postsecondary program or a registered apprenticeship. Unlike registered apprenticeships, youth apprenticeships may or may not include financial compensation.

Obviously, all of these approaches require the cooperation of employers, and in the United States it has been difficult to find enough employers to make WBL available to large number of students (Silverberg, Bergeron, Haimson, & Nagatashi, 1996, Lewis, 1997). The School-to-Work Opportunities Act of 1994 (P.L. 103-239) provided federal funding to encourage increased employer involvement, but had limited impact. This act had been passed with a sunset provision, because it was intended to provide seed money which would lead to lasting, structural relationships between schools and employers. When the federal funding ended in 2001, most of initiatives dependent on this funding faded away. If WBL is to be made available to more students, it will require more than the appeals to the good will of employers. Employers will have to see direct benefit to their firms from assuming an increased role in the preparation of young people for the workforce.

Creating a career and college curriculum requires career pathways based on the realities of the labor market and opportunities for students to experience those realities. Programs that lead to industry-recognized certification and active advisory committees can provide the labor market linkage. Career guidance, work-based learning (WBL), and career-technical student organizations (CTSO) can provide opportunities for testing one's interests and abilities outside the classroom. Both provide experiences that develop the problem solving, and interpersonal skills highly desired by employers. Students value the opportunities to apply what they study in the classroom to tasks with real-world consequences. Past attempts to expand WBL have demonstrated that employers need to see tangible benefits from the students they hire. The small number who offer internships, apprenticeships, and cooperative placements, report high levels of satisfaction with the students they employ, but most employers remain reluctant to offer training of any depth to young people in their teens and early twenties.

Systems for Delivering College and Career Ready Skills

College for all discourages students from considering a host of occupations for which workers are in high demand and that offer earnings comparable to those of college graduates. In addition, the cost of training for such occupations is far less than four years of college. Gray and Herr (2006) believe that schools have a responsibility to serve all their students− those who are at risk of dropping out and those who will enter the workforce directly after high school− as well as those preparing for college.

In thinking about multiple ways of winning, schools have begun to organize curriculum in different ways to address this issue. We briefly describe each in the following discussion. These are not mutually exclusive approaches although each is driven by different logics.

Career Custers/Career Pathways

One approach that emerged to align academic and technical content and secondary and postsecondary instruction was career clusters within which there are career pathways. Career clusters organize occupations by the goods and services they provide to society. The Office of Vocational and Adult Education, the unit of the U.S. Department of Education that administers the federal role in CTE, has adopted the following 16 clusters for funding and reporting activities receiving federal funds (for a complete list of clusters and pathways, go to www.careerclusters.org).

Within each of the clusters, there are career pathways that specify the skills and knowledge to be acquired to enter occupations at various levels within the cluster. These levels range from occupations that can be entered directly following high school to those that require postgraduate study. A career pathway becomes increasing focused as student progress through it. The States' Career Cluster Initiative, which is supported by the National Association of State Directors of Career Technical Education Consortium, has developed detailed statements of the skills and knowledge required for each of the pathways in the 16 clusters. These skills and knowledge are organized into four levels:

- Foundational academic expectations: learning standards in core academic subjects established by the separate states for secondary students
- Essential: apply to all clusters and pathways and students should be able to demonstrate them in the context of the pathways they are studying
- Cluster (foundation): apply to all pathways within a cluster
- Pathway: apply to all careers within a pathway

The first two levels apply to all clusters. The Common Core State Standards for language arts and mathematics should produce highly uniform expectations for these two content areas. Each cluster has unique knowledge and skills that all students should be able to demonstrate. It is within these foundation skills that the information relevant to AAI is presented. As students' understanding of clusters increases, they must select pathways, or as they are labeled in Perkins IV "programs of study," that lead to defined occupations. Pathways/program of study specify the academic and technical courses that students should take to be prepared to enter their occupations of choice3.

Linked Learning

California has one of the most visible efforts to initiate multiple pathways, Linked Learning. This initiative is being led by ConnectEd, the California Center for College and Career, with funding from the James Irvine Foundation. Linked Learning pathways have all the components specified for programs of study by Perkins IV, as well as requiring WBL and support services. They are built around industry themes, combining rigorous academic and technical content in coordinated, nonduplicative sequences from high school to postsecondary education. The academic component includes two years of a foreign language as well as advanced mathematics. Linked Learning pathways are designed to enable young people to obtain postsecondary credentials that lead to successful careers and satisfying civic and family lives.

Tough Choices, Tough Times

The National Center on Education and the Economy (2007) has proposed a much different approach to improving student performance. The core of their proposal is the establishment of Boards of Examinations in each state that would establish syllabi for core academic subjects and develop examinations to assess learning of the skills and knowledge specified in the syllabi. The standard for passing these examinations would be scores that would enable students to enter the community colleges in their states without the need for remedial courses. Students would take these examinations at the end of their tenth year of schooling. Those who pass would go on to community colleges or could take two additional years of high level academics such as Advanced Placement courses or an International Baccalaureate program. Those who do not pass would take additional academics designed to bring them to the level needed to pass the state qualifying examination.

Schools with Occupational Themes

In 2004, a committee of the National Research Council and the Institute of Medicine published a report that synthesized the available research on the psychological, organizational, and pedagogic variables associated with the motivation to learn in structured educational settings. The findings and conclusions of this committee represent the consensus of leading scholars who included a chapter that presents the evidence on the effectiveness of structuring schools around occupational themes. The committee identified six practices common to such schools that have the potential to enhance motivation and engagement:

1. Programs motivating students allow for close adult-student relationships. (p. 172)
2. Engagement increases in environments where students have some autonomy in selecting tasks and methods and in which they can construct meaning, engage in sense-making on their own, and play an active role in learning, rather than the passive role typical of teacher-centered classrooms. (p. 173)
3. Motivation and engagement are enhanced in well-structured educational environments with clear, meaningful purposes. (p. 174)
4. Motivation is enhanced in settings with a challenging curriculum, high expectations, and a strong emphasis on achievement. (p. 174)
5. Motivation and engagement are enhanced when students have multiple paths to competence. (p. 175)
6. Helping students develop education and career pathways can enhance their understanding of school and their motivation to participate fully. (p. 176)

The research findings underlying each of these practices are presented in the report. The committee raised the following caveat: "Although this summary represents an idealized version of schools with occupational themes, it does reflect the goals of most programs. (p. 172). The committee examined the evidence from schools that were attempting comprehensive reforms, such as career academies, but these practices also reflect the kind of CTE that we would like to see in all secondary schools. Good CTE programs, whatever their settings (comprehensive high schools, career centers, or career academies), follow these practices to prepare students for broad occupational clusters rather than specific occupations. They teach academics in occupational context and give students the skills they need to both enter the labor market and to continue their education after high school. Unfortunately, such programs are at present more the exception than the norm. If CTE is to realize its potential, more programs will have to incorporate these practices, especially challenging curriculum, high expectations, and a strong emphasis on achievement.

Career Guidance: The Missing Link

Occupational training at the secondary level is opposed by many educators because it requires young people to identify career objectives before they are developmentally ready to do so. Work in many ways signifies who we are—defining our personalities, our habits, and our lifestyles. Finding the right career

can lead to a lifetime of satisfaction, but not finding the right career can lead to poor self-esteem, lowered self-efficacy, a lack of life satisfaction, and even depression (Csikszentmihalyi & Le Fevre, 1989; Haworth & Hill, 1992; Wang, Lesage, Schmitz, & Drapeau, 2008; Warr, 2007).

Developing a career is a process, not a single decision. Unfortunately, not enough attention is paid to assisting young people to engage in thoughtful, thorough career development. One of the issues facing schools is that students are confronted with substantial career and life decisions at an early age with limited opportunities for career exploration. Students are expected to choose and follow a program of study that will prepare them to exit high school with the skills necessary to continue their education or to enter the workforce. Career-technical education students must choose specific occupational areas even though most do not continue the same career emphasis upon completing high school (Bishop, 1989; Levesque et al., 2008)6. Too often, students are offered few opportunities to engage in career exploration and given little useful information on postsecondary options (Dykeman, et al., 2003). The result is that career development is often a by-product of the educational curriculum, with a "figure it out as you go along" mentality prevalent among educators and students regarding career exploration.

The Life-Span, Life-Space Perspective of Career Development

Career theories are the framework that counselors, psychologists, and educators use to understand the career development process and provide career guidance. Career theory has a long and complex history and includes many perspectives on how to understand the career development process. Theories include trait-and-factor, stage, and social learning, to name just a few (Osipow & Fitzgerald, 1996). In addition, the development of career theory has not proceeded down a linear path. Like any complex field of study, career theories have grown out of one another, merged, and branched off in other directions, thus weaving an intricate path with the goal of understanding the hows and whys of the career process. The core of most career theories, however, is the same: an effort to explain the "evolving sequence of a person's work experiences over time" (Arthur, Hall, & Lawrence, 1989, p. 8).
From among the several competing theories of career development, we present Super's (1957) life-span, life-space theory, because it is a general theory with a perspective that addresses career development at different stages. Although other theories could have been presented, Super's theory seemed appropriate due to its capacity to address student needs at different stages and because it recognizes the need for intentional efforts toward career development. After its original publication, the theory has evolved in response to research and social changes, resulting in its most recent formulation in Super, Savickas, and Super (1996).

The career development process is unique to every person. Gender, ethnicity, ability, personality, socioeconomic status, family, geography, and opportunity all play a part in the development of one's career path, to varying degrees. Super's life-span, life-space theory takes into account many of these aspects. According to Herr (1997), Super's theory incorporates the notion of multiple-role environments that include work, family, educational, and community roles, each with varying demands and levels of significance that occur at different developmental stages in life.

In addition to the traditional trait-and-factor approach of career development theory (the process of matching an individual to a career according to his or her personality, ability, and interests) Super's theory incorporated life stages, self-concept, and social context as three areas of influence in the career development process. At the foundation of Super's theory lie life stages, vocational tasks, and self-concept (Patton & McMahon, 2006).

Super's theory posits that people progress through five stages during the career development process, including growth, exploration, establishment, maintenance, and disengagement. It should be noted that Super's theory is not a rigid stage theory in which an individual's age dictates his or her progression from

stage to stage, a process referred to as maxicycling. In fact, Super contended that movement through the five stages could be a flexible process through which people could recycle through certain stages. Super referred to this process as minicycling.

Exploration in K-12 Settings and CTE

Evidence supports the importance of growth and exploration in helping individuals develop their vocational identities and engage in thoughtful career decision-making. What efforts do schools take to help students engage in career exploration? Is there a difference in the career exploration outcomes of students who are enrolled in traditional educational programs versus those who are enrolled in CTE programs?

Career development efforts in high school settings have been portrayed as hit and miss, in that students do not typically receive comprehensive guidance services and do not engage in career planning activities to help them achieve their career goals (Hollenbeck & DebBurman, 2000; Hughes & Karp, 2004). This lack of focus on career development in K-12 programming was delineated by Bloch (1996) in a multistate survey of high school principals and counselors that revealed a lack of commitment to the career development of students, in particular for those considered at-risk for dropping out. Helwig (2004) examined the career development issues experienced by a group of students over a 10-year period in which data were gathered six times throughout their K-12 educational experiences. The students in this sample reported mediocre satisfaction with their school's role in helping them engage in career development activities, such as (a) making a connection between school subject and occupational direction, (b) feeling supported by their school in searching for a career direction, and (c) feeling supported by their school with career preparation.

Other large-sample studies echo the finding that students are not receiving the career development experiences and information they need to develop their vocational identities and help them progress through the growth and exploratory stages of career development. Wimberly and Noeth (2005) reported on a large-scale study conducted by ACT in which 2,942 8th-, 9th, and 10th-grade students completed the Educational Planning Survey. The survey examined issues related to high school programs, class selection, and the helpfulness of school, family, and friends in educational planning and decision-making. Over 77% of the students reported that they planned to attend college; however, only two-thirds of these students described their high school program as a college preparatory program—indicating a discrepancy between career guidance and program choice.

When these students eventually approach postsecondary planning, they likely will find that they have missed such key steps as taking appropriate courses, participating in pre-college programs, and obtaining postsecondary planning information from teachers and counselors. By failing to plan early, they may be closing the door on viable postsecondary education, training, and employment options for their futures. The authors concluded that middle and high school students are not taking a college preparatory curriculum that would help them to prepare for postsecondary education.

The cited research on traditional educational experiences indicates that there is a general lack of focus on career development practices in traditional high school settings. In addition, few comprehensive studies examine the effectiveness of career development interventions. Dykeman, Wood, Ingram, Gitelman, et al. (2003) described career development studies as "singular and isolated, often without consideration or measure of students' level of career development" (p. 18). On a positive note, the limited research that is available on CTE programs that attempt to link high school with postsecondary experiences (e.g., career pathways, school-to-work, Tech Prep, career magnets) shows more promise in engaging students in career development activities—if not directly, then at least peripherally, indicating that career development may be a by-product of engagement in CTE programs.

Summary

In this paper, the prevailing assumption that college ready is the same as career ready is questioned. Career ready involves academic, technical, and employability skills. The current myopic focus on academics alone, particularly in the form of advanced mathematics, ignores the realities of the labor market. The college degree has become a signal that young people have the skills and traits that employers seek, and there is no question that those with degrees earn more than those without. Such comparisons, however, ignore the wide variability in earnings of college graduates, the potential of middle-skilled occupations and the limited success that students who complete high school with a C average or lower have in postsecondary education.

Career clusters and career pathways have been developed to provide meaningful career development and technical training at the secondary level that allows students to progress as far with a broad occupational area as their ability and aspirations will take them. The Linked Learning initiative in California is assisting selected school districts to use such pathways to bring about major change in how their high schools operate. Two major reports from Harvard University and the Organization for Economic Cooperation and Development have made the case for increasing access to technical training and WBL at the secondary level.

Virtually all high school students are in the exploratory stage of their career development. They need to test their evolving vocational identities against the realities of occupations. Technical training and WBL provide opportunities for such testing. The concept of guidance must be expanded from the limited contacts that students have with counselors to a responsibility shared by all adults with significant work-related contact with youth.

Figure 1

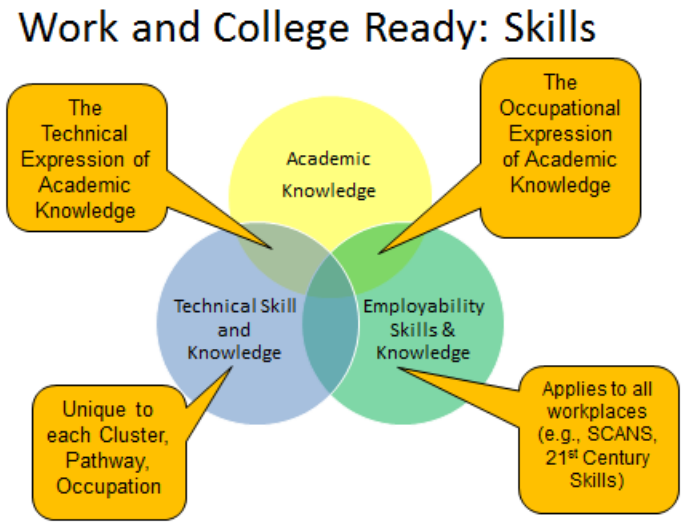

Table 1

Model Estimates of a Survival Model for Dropping Out of High School and Career and Technical Education Credit Taking. ELS:2002

Predictor	*Exp(B)*	Sig.
Socioeconomic Status	.618	.002
9th-Grade GPA	.253	.000
CTE Credit Taking		.036
3 or more CTE credits, No Focus on Occupational Area	.669	.068
3 or more CTE cr, Focus on Occupational Area	.559	.027
Cases in Analysis		
Event	120	
Censored	9190	
Total	9310	
Chi-Square	206.08	
df	4	
Sig	0.000	