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ABSTRACT

Historically, the role of career and technical education (CTE) has been a subject of debate. The various viewpoints regarding the best role for high school CTE can be condensed into the following options: (1) to provide an occupational sequence of courses that is integrated with rigorous academic course work as preparation for postsecondary prebaccalaureate technical education or full-time employment; (2) to provide an occupational sequence of courses designed solely to prepare students for the transition from high school to full-time employment; (3) to retain CTE not as a sequential occupational program of study but as unique courses or a strategy providing an applied context for teaching academics; and (4) to eliminate high school CTE altogether in favor of a common academic program for all students. These four viewpoints/options were analyzed by using a student-centered analysis that included a review of available longitudinal and high school transcript data and focused on how to best meet the needs of individual students. The following topics were considered: CTE's historical context; CTE's external/internal policy context; and characteristics and needs of CTE students. It was recommended that policymakers continue to support the model of integrated CTE. (Contains 20 references.) (MN)

# The Role of Career and Technical Education in the American High School: A Student Centered Analysis

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# The Role of Career and Technical Education in the American High School: A Student Centered Analysis

Kenneth Gray

## *Introduction*

The curriculum in the American high school is typically differentiated into at least three major programs of study: academic (ACA), career and technical education (CTE), and general. One of these programs, CTE, is the topic of this analysis. The specific question to be examined is, "what should be the role of CTE in the American high school?"

CTE is an elective program. Students can take a single course or a sequence of related courses. Students who take a sequence of three or more such courses in one occupational area are classified as CTE concentrators. Most (83%) CTE concentrators also complete an ACA concentration as well (NCES, 2001). Approximately 20% of all high school course work is in CTE.

The differentiated high school curriculum in general and the role of career and technical education in particular has historically been the subject of some debate. In the l990s this debate was re-invigorated by a number of developments (Hoachlander, 1999). Of these, the most influential was the widespread belief that a four-year college degree was necessary to ensure any kind of economic success, resulting in a corresponding increase in teens matriculating from four-year colleges. A second important factor was educational reforms that emphasized the mastery of academic skills solely, and the related effort by states to assess academic achievement via high stakes tests.

Various points of view regarding the best role for high school CTE can be condensed into four main schools of thought or options. One is the role outlined by federal legislation, namely to provide an occupational sequence of courses that is integrated with rigorous academic course work as preparation for postsecondary pre-baccalaureate technical education or full-time employment. Another is the traditional CTE role of providing an occupational sequence of courses designed solely to prepare students for the transition from high school to full-time employment. Yet another is to retain CTE, not as a sequential occupational program of study, but as unique courses or strategy that provides an applied context for teaching academics (Bragg, 1997; Grubb, 1997; Techniques, 1996). The final school of thought is the option of eliminating high school CTE altogether in favor of a common academic program for all students.

Clearly individual states or local school districts may choose to and/or have already designed hybrids of these four alternatives, but for the purpose of analysis, it is desirable to deal with these alternatives as distinct or mutually exclusive. An analysis of these four approaches—integrated CTE, traditional CTE, applied CTE and eliminating CTE altogether—is the focus of this paper.

## *Student Centered Analysis: Leaving No Child Behind*

There are two basic ways to approach an analysis of this type. One is the macro philosophical/social reconstructionist approach (see Gray and Herr, 1998). In this approach proposals are based on what policy makers believe is best for the country and students in general. The assumption, implied or otherwise, is that all students are the same. The second approach is the micro student centered approach. In this approach proposals are evaluated in terms of which best meet the needs of individual students. It assumes all students are not the same and that they have unique needs and aspirations. CTE, at least at present, is an elective program of study so that the success of any proposal will depend on the degree to which individual teens and parents view it as relevant. Thus this analysis takes the client-centered approach. Specially, the analysis first looks at high school students in general. Then the focus turns to students who take CTE and asks the question, "which proposal best meets the needs of this particular group or groups of CTE course takers?" As background, the paper first outlines relevant internal and external factors that have bearing on the analysis. Before turning to those factors, however, a definition of CTE is needed, as well as some historical background.

## *Definition Of Terms: What Is CTE?*

Presently there are at least six major different CTE program constituencies: (1) business education; (2) trade and industrial education, and health occupations; (3) family and consumer sciences; (4) technology education; (5) agriculture; and (6) marketing/ distributive education. In light of this variation, this analysis employs the generic definition used by National Center for Educational Statistics (NCES), namely a program of study that offers a minimum sequence of three Carnegie unit courses in a single Specific Labor Market Preparation (SLMP) area. SLMP areas include agriculture and renewable resources, business, marketing and distribution, health care, public and protective services, trade and industry, technology and communications, personal and other services, food and hospitality, childcare, and work study programs (cooperative education, etc.).

## Historical Background

The question of the role of CTE in the American high school has significant historical foundations. Prior to 1890, the American high school was not widely attended and had only one "classical" curriculum that was designed for the children of the elite. At the beginning of the twentieth century, however, children of working-class parents began to attend high school in increasing numbers. This development presented educators with a dilemma—these "new" students were eventually going to work, not to college, and thus the classical curriculum was largely irrelevant to most students. The solution was to differentiate the curriculum into academic programs of study and vocational programs of study. Not everyone agreed, however, with this resolution and the debate continues today. The common versus differentiated curriculum debates of the past is analogous to the academic skills versus CTE debates of today. Proposals to use CTE to provide an applied context to teach academic skills and all aspects of the industry can be traced back, for example, to arguments made by John Dewey in the early 1900s (see Gray, 1989).

## Part I: The External/Internal Policy Context

As background to this study of the role of CTE in the American high school, we take a brief look at various factors internal or external to CTE that provide the context for this analysis.

## External Policy Context Academic

### Proficiency/High Stakes Testing

By the mid-1990s, the focus of educational reform—which had begun as an effort to ensure that the country would have a world–class workforce—had narrowed from teaching generic SCANS (Dept. of Labor, 1991) type work skills (including academics) to a narrow focus on the mastery of traditional academics as preparation for college. As a result of this academic proficiency movement, most state and national educational/school reform efforts now focus on academic skills and assessment only. In some states the stakes for not passing these tests are quite high in that it determines what type of high school diploma a student will receive. In most states, CTE concentrators must take these tests.

### High School Drop Outs

The percentage of students who do not complete high school is still very much a national concern. The national high school completion rate is around

74% (see Greene, 2002), meaning that between the 8th grade and 12th grade graduation, one out of every four students drops out. Among Latino students the dropout rate is estimated to be 45% or almost one out of every two. As will be discussed presently, CTE is effective in reducing dropout rates and Latinos are the least likely to be enrolled in CTE.

### *Preference For Baccalaureate Education And Professional Employment*

In an NCES study, 95% of high school students indicated they planned to continue their education, while 85% indicated they planned to get a four-year college degree. By the late 1990s, over 70% of high school students were matriculating within two years of graduating from high school, with the vast majority entering four-year colleges. Asked what their career goal was, 2 out of 3 girls and 1 out of 2 boys indicated plans to pursue a professional career (see Gray and Herr, 2000). Of respondents to the 2001-2002 survey of entering four-year college freshmen only 4% of males and 1% of females indicated plans to pursue a major that would lead to a non-professional technical career (American Council on Education, 2001).

### *College Graduation Rates And Underemployment*

While college enrollment has risen dramatically, college success has not. The six-year graduation rate at division one universities is just over 50%. Of those who graduate with a bachelor's degree, 43% report being underemployed two years later and the same percentage indicated they held jobs with no career potential four years later (NCES, 1993). Among those who majored in arts and science, the rate of underemployment was 67%.

### *Labor Market Shortages Of Technicians*

The high-skills/high-wage workforce is composed of three levels of workers: professionals, technicians, and blue-collar technical workers. Of these three groups, professionals (engineers, system analysis, etc.) trained at the four-year level and are generally assumed to be the largest group. In reality, however, the second group, technicians, is equal in number and in some cases greater. For example, Department of Labor projections predict that by 2010 there will be 380,000 computer software engineer positions, which will require a four-year degree, but 490,000 positions as computer support specialists that require an associate's degree. Importantly, while there is a worldwide surplus of engineers, there are critical shortages of technicians. Equally important, while firms will recruit engineers nationally or internationally, they hope to find technicians in the local labor market. Thus, "A region that does not have a growing percentage of its non-professional workforce trained beyond high school will have ever

increasing difficulty supporting the competitiveness of high-value business" (PA Economy League, 1996).

### *Learning Theory/Contextual Learning/Transfer Appropriate Processing*

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 (Berrymen, 1991). 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 de-contextualized 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 (Morris et. al., 1979).

## *Internal Policy Context*

### *Stabilization Of CTE High School Enrollments*

Enrollments in high school CTE programs fell dramatically in the 1980s. In recent years, however, enrollments have stabilized nationally. At present, one-quarter of all high school students complete a concentration in CTE when defined as having taken three or more credits in a single SLM.

### *Integration Of Academic And Vocational Education*

As part of the overall basic skills movement and the assumed relationship between academic skills and career success, Perkins Act legislation now calls for the inclusion of academic skills mastery as an instructional/student performance objective of CTE. By 1998, 83% of CTE concentrators were also completing an academic concentration.

### *Tech Prep*

The federally defined mission for CTE changed with the Perkins Act of 1990 to include preparing students for the transition to postsecondary pre-baccalaureate technical education. Called Tech Prep, the program called for high school integrated CTE to be closely articulated with postsecondary technical education programs. Longitudinal data suggests that presently more than half of

all integrated CTE concentrators go on to college; of this group more than half enroll at the two-year associate degree level.

### *Federal Versus State/Local Control*

Only a small percentage (6% or less) of vocational education funds are federal. Thus CTE is still largely a state and local issue. CTE is also an elective program of study. Thus, ultimately the viability of CTE is determined by how many students elect it. Importantly, school districts will not continue a model of CTE that students do not elect.

## *Part II: The Career and Technology Student*

The issue of the appropriate role for high school CTE hinges first and foremost on who CTE students are and how they can best be served. Thus, the analysis now turns to this issue.

It is important to note that what follows is based on data from two "different data sets." One is the 1998 high school transcript study that contains data regarding high school courses completed by a national sample of 1998 high school graduates. The other is the National Longitudinal Study (NELS 88) that began with 1988 8th graders who then graduated in 1992. While the latter is the most current, only the former provides longitudinal data regarding 8th-grade achievement of entering 9th graders and post-high school pursuits of graduates.

### *Curriculum Distribution of High School Students*

Table 1.
Demographic Distribution of High School Graduates by Program of Study:
1998 High School Graduates

| | Entire Sample | Academic ACA | Integrated CTE/ACA | Traditional CTE | Neither |
|---|---|---|---|---|---|
| 1998 | | 70% | 20% | 4% | 6% |
| | | | | | |
| Male | 44% | 44% | 53% | 66% | 46% |
| White | 59% | 60% | 58% | 51% | 48% |
| Black | 18% | 12% | 22% | 9% | 17% |
| Hispanic | 14% | 13% | 13% | 10% | 27% |
| Other | 9% | 10% | 7% | 30% | 8% |
| | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| 4E,3SS, 3M,3S,2F | | 54% | 33% | 0% | 0% |
| 4E,3SS, 3M, 3S | | 64% | 53% | 0% | 0% |
| 4E,3SS, 2M,2S, | | 100% | 100% | 15% | 15% |

***Key***

Academic (ACA) = (4 E. 3SS, 3 M, 3 S)
Integrated (CTE & ACA) = 3 or more CTE courses in the same SLM & (4 E. 3SS, 3 M, 3 S)
Traditional (CTE) = 3 or more CTE courses in a single SLM
Neither (NI) = completed none of the above.

Source: National Center for Educational Statistics. 1998 Transcript Study. NCES 2001-98. Tables 6, 7 & 15. Note: sample distribution various from the population at large due to over-sampling to ensure sufficient cell size for analysis.

In 1998, 70% of high school graduates completed an academic concentration, 20% an integrated academic and CTE program, and 4% a traditional CTE only concentration. It is also worth noting that 6% of the sample in 1998 failed to complete any concentration. There is some indication that the 1998 transcript data may undercount this group of "general" students. A study of 1992 high school graduates using NELS 88 data (Plank, 2001) and the same curriculum type definitions found that 38% had failed to complete either academic or CTE concentrations.

### *Characteristics Of CTE Concentrators*

Table 1 provides descriptive data about CTE concentrators. Based on the transcript study distribution, males are more likely to complete both an integrated and traditional CTE program of study. This is particularly true of traditional CTE students where males outnumber females by 2 to 1. The distribution of whites in both CTE programs was normal. African-Americans were slightly over-represented in the integrated program and significantly under-represented in the traditional CTE program. Hispanics were significantly over-represented among those who completed neither an academic, integrated, nor CTE concentration.

### *Academic Achievement Prior To High School*

Table 2 provides 8th-grade test scores for 1992 high school students included in the NEL88 longitudinal study. In terms of academic preparation upon entering high school, CTE only students were the poorest prepared, followed by

NI. ACA students entering high school were the best prepared, followed by those who ultimately completed an integrated CTE/ACE program.

Table 2.
Mean 8th Test Scores by High School Graduates Program of Study:
1992 High School Graduates

| | Academic ACA | Integrated CTE/ACA | Traditional CTE | Neither |
|---|---|---|---|---|
| Math | 41 | 37 | 31 | 34 |
| Science | 21 | 20 | 17 | 18 |
| Reading | 31 | 28 | 23 | 26 |

Source: Plank, 2001

### *High School Academic Achievement*

While as a group academic concentrators enter high school better prepared than integrated CTE concentrators, the achievement gap was either small or insignificant by the time they graduated (Levesque et al., 2000; Plank, 2001). The traditional CTE only students, who entered high school the poorest prepared, graduated from high school with the lowest achievement.

### *High School Course Taking*

The major difference in course taking patterns of academic and integrated CTE/academic students is that the former are much more likely to take a foreign language. However, when foreign language is not included there is only a small difference between the percentage of ACA (64%) who take three years of math and science and those in CTE (53%) who take the same sequence (see table one). Considering that ACA/CTE students also take, on average, 6.5 credits of CTE, these percentage differences in course taking are smaller than anticipated (Lesveque et al., 2000). Using the NELS 88 data set, NRC researchers (Plank, 2001) found a similar pattern for 1992 graduates.

Only 15% of CTE and NI students took two years of math and science. Stated another way, 85% of these students graduated from high school with less than two years of math or science—an important clue to the identity of these students.

On average, high school students take three courses of CTE. This number declined only slightly during the 1990s. Of course some take a lot more, some a lot less. Academic concentrators, for example, on average only take one

semester of CTE. Nonetheless, transcript data indicates that CTE course taking is significant, suggesting that one-fifth of all high school course work is in CTE.

### *Likelihood Of Dropping Out Of High School*

Numerous studies have demonstrated the positive effect of CTE on reducing high school dropout rates. The most recent, a study commissioned by the National Research Center for Career and Technical Education (Plank, 2001), found that taking CTE courses was related to persisting to graduation. This effect was positive for any ratio of CTE to ACA courses but was maximized at a ratio of 3 CTE credits to 4 academic or 40% CTE to 60% academic ratio. Most important to this analysis, the drop-out prevention effect was the most dramatic for those students who were at greatest risk of dropping out when they entered high school; namely, students whose test scores and GPA entering high school were one standard deviation or more below the mean.

### *Attending Higher Education*

The probability of ACE/CTE graduates going on to college after high school is 60% versus 72% for academic students. For traditional CTE only concentrators the probability is only 37% but the probability that they will be full-time employees is 60%. Noteworthy, and of possible relevance to this analysis, is the fact that the probability that students who complete neither CTE nor ACA will enroll in college is 50% (Plank, 2001). Considering that these students may graduate unprepared for either college or work, the fact that half are in college points to ever-growing higher education remediation rates.

### *Special Needs Students*

Special needs students are probably over-represented in CTE programs. For example, while 34% of the graduating class of 1992 was composed of special needs students (disabled, disadvantaged, or LEP), 43% of the vocational credits earned by special population students earned this class. Non-special needs students took on average 3.7 CTE credits, disabled students took 5.6 credits, and LEP students 4.2 credits (Boesel, 1994). The largest group is enrolled in occupationally specific courses designed to prepare them for the transition from school-to-work. Data from the 1998 transcript study confirm these 1992 findings. Among the four curriculum groups, students completing special education courses were predominantly in the traditional CTE only and NI categories (NCES, 1998, Table 35).

## *Summary*

NCES longitudinal and high school transcript data present a fairly clear picture of the three groups of students who take CTE courses and thus of CTE's current role in the American high school. The picture that emerges is somewhat different than the rhetoric that portrays all CTE students as academically backward, in need of additional academic preparation, and work-, not college-bound.

The first and largest group of CTE concentrators is composed of those who graduate having completed an integrated program of both CTE and academics. Of this group the majority go on to pre-baccalaureate postsecondary education. Importantly, researchers found virtually no difference in academic achievement between ACA/CTE students and ACA only students despite the fact that the former enter high school with lower 8th–grade test scores. While empirically untested, it appears that this gap is remedied by a combination of CTE and ACA courses. In fact, the only standout difference between ACA and CTE/ACA students is that the former are more likely to take two or more years of a foreign language, and to take on average one semester more of math. Thus, for this group of students, CTE coupled with ACA seems to be preparing them academically as well as for college or full-time employment.

The second and much smaller group of CTE concentrators is composed of students who complete only a traditional CTE concentration. These students accounted for 4% of all graduates and 17% of CTE concentrators in 1998. Demographically, they are twice as likely to be male, enter high school academically deficient, be from the poorest homes, and be generally at risk. Many are special education students. For example, only 15% completed two years of math in1998, even though the majority of states require at least two years or more of math to graduate. These CTE students are the most likely to go to work. CTE plays a dual role for these students by, first, being effective in preventing them from dropping out of high school, and second, being effective in assisting them in making the transition from high school to full-time employment.

The third group is composed of students who take CTE not as a program of study but as a source of elective courses. For example, in 1998 the mean number of CTE courses completed by high school graduates was 3.17. Among ACA students, the majority took at least one semester of CTE as electives, mostly in business and telecommunications. Thus, while some students take a sequence or concentration, virtually all take one or more of these courses as skill-building electives, presumably for college.

## *Part III: Policy Assessment Criteria*

The following criteria will be used to evaluate various roles for high school CTE.

Educational Equity: Ensuring a relevant and effective high school education for all students: work bound, technical college bound and four-year college bound.

Leaving no child behind requires that within reason, every teenager in high school deserves to get an education that meets their needs, meaning a program of study that is "relevant" to their post-high school pursuits and "effective" in preparing them to be successful in these pursuits. This is the underlying rationale, for example, in providing expensive advance placement/honors programs for the academically gifted. Thus the primary criterion of this analysis is to ascertain which alternative(s) provide(s) a relevant and effective education to various groups of students, specifically students who will go to work after high school, those who will go to pre-baccalaureate technical colleges, and those who will go to four-year colleges.

To a large extent the relevance and effectiveness issues are the crux of current debates regarding the role of CTE in the American high school. Those who argue that all students' time would be best spent taking academic course work, not CTE, are in fact arguing that a single academic curriculum provides both a relevant and effective education for all students. Those who argue for some form of CTE are in fact arguing the opposite.

### *Likelihood of Implementation at the School Level*

At present, CTE is both an elective course in the high school program of study and funded primarily via local funds. Thus, ultimately the role of CTE in the American high school will be determined by the form of CTE that provides what students want, is acceptable to their parents, and that school boards are willing to fund. For example, while ability grouping — such as honors courses, etc.— may be labeled as undemocratic by some and ineffective by others, at the local level some students prefer it, parents want it and school boards are willing to fund it. Thus it is relevant to ask what model of CTE is likely to be acceptable and thus supported/funded at the local high school level.

### *Maximizing Academic Achievement*

Arguably, academic skill achievement is relevant to all students. Therefore, one goal of an effective CTE model is to promote academic achievement.

### *Preventing High School Drop Outs*

The vast majority of young adults hold high school diplomas; however, this does not mean they have completed high school. One in seven high school graduates holds a GED diploma. The high school dropout rate is still around 25%. Assuming it is preferable for students to get a diploma via graduating from high school, preventing students from dropping out is included as a criterion.
Reducing Technical Skills Shortages

Most, if not all, technician level employment now requires education beyond high school, but below the four-year degree level. Presently the demand for technicians exceeds the supply. Meanwhile only 2% of entering four-year college freshmen expressed an interest in pursuing majors in these fields. Thus the college prep program has not proven to be an effective feeder of students into postsecondary pre-baccalaureate technical education while CTE has been effective. A relevant criterion, then, is to determine which form of CTE is effective in serving as a feeder.

### *Costs*

Funds are always limited. The decision to do one thing means that a decision has to be made not to do another. Thus, the cost of various proposals is an evaluative criterion.

## *Part IV. Career And Technical Education Options*

A review of the literature on roles for high school CTE (see Gray & Walter; 2001) revealed four main proposals. These options are defined below in terms of their content, student performance, and outcome goals.

Integrated CTE: A "program" of sequential occupational courses in a single SLM integrated with a program of sequential academic courses. Performance goal is general occupational competency and academic mastery of the traditional academic curriculum. Outcome goal is the transition from high school to postsecondary pre-baccalaureate technical education or full-time employment.

Traditional CTE: A "program" of sequential occupational courses in a SLM. Performance goal is entry-level occupational competence. Outcome goal is transition to full-time employment.

Related Academics: An instructional strategy of providing courses with broadened occupation content (clusters) related to traditional academic subjects

(math, science, etc.). Performance goal is academic mastery. Outcome goal is transition to college.
Common Academics: Traditional academic course sequences. Performance goal is academic proficiency. Outcome goal is transition to college

## *Part V. Analysis*

Table 3 provides a cross–tabulation of four policy options for high school CTE and the evaluative criteria. While all criteria are weighted equally, the order in which they appear suggests the author's view of their relative importance. By way of example, in the author's view the population of teens most in need is composed of those who enter high school at risk. Thus, relevance and effectiveness for this group is the first criterion, followed by relevance to the technical college bound and then to the college bound. These criteria are followed by the likelihood of acceptance and thus implementation at the local high school level, promoting academic proficiency, preventing drop outs, and alleviating state and national technical skill shortages and costs. Costs are listed last, although admittedly at the local level cost is a primary consideration. A simple yes/no scale was used. Yes indicates the proposal met the criteria, while no means it did not. Yes/no values were assigned based on the data provided in parts I, II, and III.

TABLE 3.
Analysis of CTE Policy Options by Assessment Criteria

| Options<br>Criterion | Integrated CTE (CTE/ACA) | Traditional CTE | Applied CTE (ACA/CTE) | Common academics: eliminate CTE |
|---|---|---|---|---|
| Relevance & Effectiveness to Work Bound Students | Yes | Yes | No | No |
| Relevance & Effectiveness to Technical College Bound Students | Yes | No | Yes | No |
| Relevance & Effectiveness to Four-year College Bound Students. | No | No | No | Yes |
| Likelihood of Local Implementation | Yes | Yes | No | No |
| Promote Academic Proficiency | Yes | No | Yes | Yes |
| Prevents Dropouts | Yes | Yes | No | No |

| | | | | |
|---|---|---|---|---|
| Alleviates shortages of pre-baccalaureate trained technicians. | Yes | No | Yes | No |
| Lower Cost $ | No | No | No | Yes |
| Totals | Yes = 6 | Yes = 3 | Yes = 3 | Yes = 3 |

## *Part V: Recommendations*

Based on the analysis summarized in Table 3, the integrated (CTE/ACA) model was judged superior.

### *Integrated Career And Technical Education*

The integrated career and technical education model ensures that no child will be left behind by, first, providing a sequence of occupational courses that keeps at-risk children in school and by doing so effectively so that they make a successful transition from high school to work. Second, the model provides a relevant and effective education to students whose postsecondary goal is pre-baccalaureate technical education (60% go on to college; of these, 60% enroll in pre-baccalaureate programs). Finally, the occupational course sequence of the integrated model provides elective skill-building courses for the four-year college bound high school students, particularly in the areas of telecommunications and business software manipulation.

Acceptance of the integrated model by some students and their parents, and the willingness of school boards to fund it is indicated by the fact that one out of every five high school students completes presently an integrated career and technical education program. Furthermore, evidence suggests the integrated model for career and technical education is effective in promoting academic achievement. According to an analysis of 1992 longitudinal transcript data, despite entering high school with lower 8th-grade test scores the academic achievement of students completing an integrated career and technology program of study was the same as for those who completed just the academic program. In fact, the only meaningful difference between academic courses taken by integrated career and technical students and those taken by purely academic students was that the latter were more likely to complete two years of the same foreign language.

Finally, the integrated model is the only approach that has the potential to alleviate the shortages of pre-baccalaureate trained technicians in the nation. It is the core of the high school element of the tech prep model. Meanwhile, tech prep is the only program in the nation's high schools that is designed to promote the transition to pre-baccalaureate technical education. The important point is that

surveys of entering four-year college freshmen indicate that those who complete the academic program only are not likely to pursue technical education. Only 2% express an interest in this type of program. Teens who do pursue postsecondary technical education are much more likely to have completed an integrated career and technical education concentration. One can speculate that their involvement in integrated CTE motivates them to be upward mobile and to pursue related postsecondary technical education. In addition, it is important to note that just as advanced academic course work promotes success and advanced placement in baccalaureate education, prior relevant occupational course work in high school promotes success and advanced placement in pre-baccalaureate technical education as well.

The one drawback to the CTE/ACA model is that it is expensive. The per-pupil costs of providing the type of contextual education that typically requires instructional labs or supervised work-based learning are greater than those of providing de-contextualized academic classroom-based education.

### *Traditional CTE*

CTE alone, without an integrated academic concentration, is effective as a dropout prevention/transition to full-time employment for at-risk youth, many of who are also special education students. This benefit, however, is also achieved via the integrated model. At present it is common practice for example to have special needs students mainstream into integrated CTE occupational classes.

### *Applied Career And Technical Education*

The applied CTE model was judged to be relevant and effective only for students whose goal is postsecondary technical education. Faced with taking the traditional academic program only or applied CTE, it is likely that some of these students would elect the applied program. But lacking a sequence of occupational courses and thus concrete educational experiences, it is unlikely this model would be either relevant or effective with at-risk youth. Meanwhile, students who now complete an academic (college prep) concentration are as just as "unlikely" to elect applied CTE as they are to elect the integrated or traditional CTE. These students want to be able to say they are in the college prep program, period!

The related CTE model is in reality similar to technology education (industrial arts). Thus, it is important to note that technology education enrollments declined significantly in the 1990s, providing a reason to question the viability of the applied model. Therefore, the hope that large numbers of students would elect to take a similar program, namely applied CTE, seems unfounded.

### *Common Academics: Eliminate Career And Technical Education*

The final proposal that was examined was to eliminate career and technical education altogether in favor of a common academic program for all students that can be best described as "college prep" for everyone. It is by far the least expensive option. Whereas college prep is the curriculum completed by about 70% of high school students, most teens and parents perceive it as relevant and effective. But is it? If the traditional academic or college prep program is adequate for all students, then why do most high schools need to also offer additional and costly advance placement and honors programs as well? They do so because the standard academic program does not meet the needs of a small group of students blessed with academic ability and whose goal is to compete for admission at selective colleges. More to the point, there are other groups whose needs are not met by an academic program of study, namely those interested in postsecondary pre-baccalaureate technical education and those at risk. If no student is to be left behind, then the needs of all students must be addressed. Strictly academic high schools do not meet the needs of diverse students but high schools with integrated career and technical education do.

## *Final Thoughts*

## *Federal Priorities And The Federal Role*

Because career and technical education has been supported in the past by federal legislation, the question of its role in the future leads inevitably to the related question of whether CTE is still a federal priority and, if so, what the federal role will be. Aside from defense and health issues, federal priorities are those that relate directly or indirectly to stimulating economic growth and ensuring equal individual opportunity and thus personal wealth. The reason basic academic skills assessment has become a relatively recent federal priority, for example, is the perceived nexuses between academic skills and the economic well being of the nation. The belief is that individuals who lack these skills will not be able to maximize their human potential nor contribute to economic growth. In this paper, it has been argued that integrated CTE does address pressing economic labor force priorities and is relevant and effective with students who are not well served by the academic or college prep program now taken by the majority of students. Thus, if an adequate supply of technicians is a federal priority and if ensuring a relevant and effective education for one out of every four high school students is a priority and if reducing high school drop out rates is a priority, then CTE is a priority as well.

If CTE is a priority, what is the federal role? The first federal role in CTE is similar to the federal role in special education, compensatory education, etc., namely, to ensure the programs exist in the first place. Without federal funds to

leverage state and local funds, high-cost CTE programs will gradually disappear in the face of fiscal restraints at the local level. Thus, the first federal role in career and technical education is to provide funds that leverage state and local dollars to ensure career and technical education is available to those students who need it.

The second federal role is to use federal funds to leverage CTE program reform and improvement. While this has been a traditional federal role in CTE, it has been tempered in the recent past by the argument that curricular issues are best left to states and local school boards. Recent federal education legislation suggests this attitude has changed markedly, opening the way to a much more proactive federal role in CTE curricular changes. Such efforts include stimulating the movement toward broad-based clustered programs of study, mandatory work-based learning experiences, review of CTE teacher licensure requirements, stronger articulation with postsecondary technical education, etc.

### *Secondary Versus Postsecondary Technical Education*

One of the behind the scene issues stimulating the current debates regarding the role of high school CTE are efforts to channel more federal CTE dollars into postsecondary technical education. The argument is that postsecondary technical education is now more important than high school programs and therefore should be the main or at least an equal federal funding priority. There is ample evidence, for example, that many of the occupations high school CTE had historically prepared students for now require a postsecondary vocational certificate or degree. And while claims that all jobs in the future will require some post-high school education are groundless (the Department of Labor projects that only 29% of all work and 42% of new jobs will require postsecondary vocational degrees or college degrees through 2010), it is clear that most high-skill/high-wage occupations now require (or at least employers prefer that applicants have) postsecondary credentials. Thus, some argue that high school CTE should be de-emphasized in favor of postsecondary technical education. Assuming that funding is a zero sum game, this issue pits high school CTE against technical college/community college based CTE. This dichotomy is, however, shortsighted.

Experiences in the U.S. and abroad, most notably in Australia, demonstrate the presence of a symbiotic relationship between high school and postsecondary technical education. A strong postsecondary system cannot exist without a viable high school system because the high school system is the feeder for the postsecondary system. It is wise to remember that only 2% of four-year college freshmen expressed an interest in non-professional technical careers and that the majority of these students come from the academic or so-called college

prep program, demonstrating that academic programs alone do not inspire students to pursue pre-baccalaureate technical education.
Australia's experience is instructive. In the 1970s high school CTE was virtually eliminated by mandate. The result was that the number of high school dropouts increased and postsecondary enrollment in the technical college system declined. Today, high school CTE is being brought back, dropout rates are declining and postsecondary technical education enrollment is booming.

The equation is the same in the U.S. It is interesting to observe, for example that virtually every state that has a good postsecondary technical college system or community college system that endorses the technical education role, also has viable high school systems. One does not prosper without the other. Thus the real issue is not whether high school or postsecondary technical education is the priority but how the two can be combined into an improved seamless system.

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