

New Directions for High School Career and Technical Education in the United States

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Abstract

New directions for high school career and technical education in the United States 21st Century are identified and briefly described. The work is based on a review and synthesis of contemporary creative thought, opinion, policy-influencing documents, research, and reflective thinking from a plethora of stakeholder involved generally with high school education and more specifically with career and technical education. Four forces underpin reform of high school vocational education in the US: The new economy, public expectation for schools, new research on student learning and motivation, and high school reform. Six components are integral to reform: High school majors, contextual teaching and learning, work-based learning, authentic assessment, career academies, and tech prep.

Career and technical education (formerly known as vocational education) is the most prominent term used in United States high schools today to identify collectively those curriculum programs designed to prepare students to acquire job skills and related general or academic education, enabling them to enter the labor market immediately upon high school graduation. Nearly all US high schools offer introductory courses for purposes of general labor market preparation such as word processing (formerly known as typing), introduction to computers, technology education, and family and consumer sciences. About 75 percent of all US comprehensive high schools also offer several courses in one or more specialized labor market preparation programs in areas such as agriculture, business and marketing, health occupations, food services and hospitality, child care, trade and industrial education, technical and communications, etc. Typically, high schools will offer at least three Carnegie unit courses in one or more of these specialized labor market programs.

Throughout the latter part of the 20th Century, particularly during the 1990s, researchers and observers began to note and document fairly significant changes in US high school vocational education. The reasons for change seemed to be in response to declining enrollments in most traditional vocational education programs, an often poor image or perception of the quality of these programs, various state policy changes requiring high school students to enroll in more academic courses and thus leaving less time in the school day for "voc ed," or pressure from businesses and other economic factors to improve curriculum. As might be suspected, substantive changes did not come everywhere nor easily, not always often enough, and usually accompanied with great debate on the contemporary role of vocational education in the US high school, its purposes, structure, and value.

There were, in the late 1980s and 1990s, mixed directional signals about the future of high school vocational education among federal and state policy makers, professional educators--especially those engaged in school reform, the vocational education establishment itself, the business community, and public watch-dogs. Four schools of thought seemed preeminent:

1. Concentrated preparation in specialized job skills targeted primarily to the 8-12 percent of educationally disadvantaged students who, in all likelihood, will not attend college and who need extensive job training to enter the labor market upon high school graduation;
2. "Education through occupations," where career and technical education is recognized as an educational instructional modality for teaching traditional academic courses;
3. Job skills targeted to about one-third of high school graduates who are not college bound--at least not immediately upon graduation from high school; and
4. A k-14 model, whereby the curriculum and programs in high school career and technical education are closely articulated with those in postsecondary institutions and the student outcomes include a valid occupational license or certification, diploma, associate degree, and/or career sustaining employment.

Thus, at the turn of the Century and at the time of the work described in this paper, vocational education (now becoming known as career and technical education) seemed to be at a crossroads. There was consensus that much needed to be changed but what those specific changes ought to be or in what direction were not well documented.

Purpose

The purpose of the work described herein was to underpin, identify, and then describe new directions for career and technical education in American high schools. The essential purpose of this paper is to describe an appropriate education and experiences needed by US high school students to prepare them concomitantly to enter employment upon graduation and/or to continue studying in postsecondary institutions at that time or at some later period in their lives.

Methodology

New directions have been drawn from a review and synthesis of creative thought, opinion, policy-influencing documents, research, and reflective thinking from a plethora of stakeholders involved generally with high school education in the United States and specifically with career and technical education. Position papers, strategic plans, and other documents—primarily those published in the 1990s—were reviewed from many education groups, trade and professional organizations, state and local school systems, business or business coalitions, and government.

Presentations to and conversations were held with participants at the national conferences of the Association for Career and Technical Education (ACTE), the National Association of State Directors of Vocational and Technical Education Consortium (NASDVTC), and the American Association of Colleges for Teacher Education (AACTE); three regional conferences on *Improving America's Schools* sponsored by the US Secretary of Education; and two state career and technical education conferences, New York and Kentucky. Discussions were held with participants on several e-mail listserves, including state directors of vocational and technical education, faculty/administrators affiliated with the University Council for Workforce and Human

Resource Education (UCWHRE), those on-line with the National Center for Research on Vocational Education (NCRVE), and two others focused on high school reform and teaching and learning.

Face-to-face, telephone, or focus group interviews were held with many business persons, representing a range of industries; trade and professional association executives and staff; public school administrators; state directors of career and technical education programs; university deans and faculty; government officials; and other individuals known to have researched and published about and/or advocated widely for career and technical education. Open-ended responses about the vision or new directions for secondary-level education necessary to prepare youth for success in 21st Century workplaces were received through mail and/or e-mail from over 200 individuals.

The literature and research review, interviews, conference presentations and conversations, and review of written strategic plans and positions took place from July, 1998 through June of 1999. Subsequently, drafts of written sections about new directions or an executive summary were reviewed by and discussed with over 50 stakeholders (e.g., state directors of career and technical education, federal officials, and staff from business coalitions or professional associations). Where appropriate, directions were modified in an attempt to reach consensus from primary stakeholders.

The Grounding of High School Career and Technical Education

Briefly reviewed here are four forces that are underpinning the demand for reform in high school vocational education, hereafter referred to as *career and technical education*: (a) The new economy, (b) public expectations for students, (c) new research on student learning and motivation and effective teaching, and (d) a loud and vocal call for reform of the American high school.

The New Economy

As economists are widely pointing out, it is no longer a post-agricultural or post-industrial world. Rather it is a *new* world of fast communications and information, rapid decision-making, and intelligent social skills that are needed to deal with economic, technical, ecological, and ethical issues identified with complex problems facing every economic, social, or political system (Nijhof, 1998). This new economic world is vastly different from the agricultural/factory environment that ushered in US public school vocational education at the turn of the 20th Century. It is characterized today by international activity, cyberspace, ever-changing market demands and standards, rapid product life cycle, ever-increasingly sophisticated computers, and need for a more thorough knowledge of the holistic (the gestalt) of the business environment rather than just specific skills or narrow job tasks (Carnevale, 1991; O-Hara-Devereaux & Johansen, 1994; Wirth, 1992). Today's workplaces are often in multi locations characterized by cultural diversity—almost mosaic, fragmented or “different” organizations and infrastructures, periodic economic restructuring, and constantly changing worker roles and duties.

Increasingly, economists and scholars talk about the ascendancy of knowledge as a primary product and competitive edge for many businesses; increased reliance on team problem solving—often from remote locations; and incredible (and sometimes difficult) need to manage information and technology; ability to analyze, synthesize, and evaluate information and use that information to solve problems; new versions and forms of prerequisite technical skills; flexible jobs; and new iterations of related education and skill requirements, that is, a constant need to continue to learn and upgrade (Bernhardt,

Morris, Hardcock, & Scott, 1998; Brown, 1999; Carnevale, 1991; Marshall & Tucker, 1992; Wirth, 1992).

Related, the specific skills to enter and succeed in these workplaces have also changed significantly in the past two decades. Technical and technological skills remain important, but they must be modified and grounded in employees' ability to think of them in the context of the big picture (i.e., technical skills' role in knowledge and understanding of all aspects of the industry). Employers increasingly discuss the importance of new skills crucial to employees' ability to work effectively, such as knowing how to learn, interpersonal skills, competence in applying general education (reading, writing, calculating, computing) to workplaces, ability to work in teams or groups, effective listening and oral communications skills, adaptability and flexibility, personal management skills with good self esteem, and personal and workplace ethics, leadership or initiative, and—seemingly, above all—the ability to think and to solve problems in workplaces. Many of these skills were once reserved for those in management; today, they are considered necessary for individuals of all levels of employment (Alpern, 1997; Clagett, 1997; Evers, Rush, & Berdrow, 1998; Secretary's Commission on Achieving Necessary Skills, 1991; Stasz, Ramsey, & Eden, 1995).

In the US today, less than 20 percent of the workforce is in jobs classified as unskilled. This is almost an exact reversal of the nature of the American workforce just 40 years ago. In 1959, 60 percent of the workforce was unskilled, with 20 percent classified as professional and 20 percent as skilled. Today 60 percent of the workforce is in skilled occupations and 20 percent in professions. The assembly line, single-skill jobs of the factory or construction site and the office clerk typist or bookkeeper are largely defunct. Rather, there is a tremendous demand for educated people with general

employability and specialized technical skills in areas related to computer science and computer science technology, high-tech manufacturing, software development, biotechnology, biomedical applications, sales and services, data base management, and health care. Nearly all of the rapidly growing jobs and occupations require postsecondary or extensive continuing education (Murnane & Levy, 1996; 10 Hot Jobs, 1999; 21st Century Skills for 21st Century Jobs, 1999).

Thus, it is important to recognize in any redirection of high school career and technical education the role the new economy is playing in determining the need for all students today to have increasingly higher levels of academics and, simply stated, to know more and to be able to learn even more. Not only will they be better prepared--both in the short term and in the long term--for career sustaining employment, but various government data sets show that higher levels of learning result in (a) significantly increased wages over the lifespan, (b) improved worker productivity, (c) less unemployment, (d) greater employee benefits, (e) ability to negotiate successfully changes in workplaces, and (f) exposure to and engagement with technology. (See, for example, Bureau of Labor Statistics, 1998; Choy, 1998; Decker, 1996; Medrich, 1996; Phillippe & Patton, 2000; Toth, 1991; 21st Century..., 1999). It is simply in the best interests for all high school students to plan for and prepare to attend postsecondary education whether they want to or not. This is crucial information and needs increasingly to be included in career development and guidance sessions for all students in all schools.

Public Expectations

US public survey data lead to two conclusions about expectations relevant to career and technical education: (a) The public does indeed want career education and

work skills included as critical components of the public school, K-12, curriculum, and (b) parents expect their children to attend college.

Marzano, Kendall, and Cicchinelli (1999) concluded that five subject areas have majority acceptance by the American adult public as *definitely* necessary in school curriculum: Health, work skills, language arts, technology, and mathematics. All standards identified with the work skills subject category were rated as definitely necessary; the specific skills were drawn heavily from general employability skills and included for example, standards about working with others, working with tools and technology, work ethics, and managing money. This government-funded and Gallup-conducted study also concluded that a main goal of education should be to provide knowledge that helps individual students obtain meaningful employment.

Nearly 100 percent of parents say they want their children to attend college, and the vast majority of students say they plan to do so. Nearly all graduates of the class of 1992 said they planned to attend postsecondary education either immediately after high school (77 percent) or at some later point (an additional 20 percent); 71 percent of them said they planned to earn a bachelor's degree. These figures generally held regardless of parents' formal education, income level, race, or ethnicity (Choy, 1998).

In reality, however, actual college attendance compared with wannabe college attendance is far from a perfect correlation. Levesque and colleagues (2000) found that about 73 percent of those 1992 graduates were enrolled in a postsecondary institution within two years of graduation. About 67 percent of 1997 high school completers were enrolled in college in October of that year; nearly 2/3 of them at a 4-year college and another 1/3 at a 2-year institution (Bureau of Labor Statistics, 1998).

Despite the positive enrollment of high school graduates into higher education, studies indicate that the U. S. has a dismal record for college program completion or graduation. According to a most recent study by ACT, nearly 26 percent of all 1999 freshmen in four-year colleges and 44.9 percent of freshmen at two-year colleges did not return for a second year. Further, ACT claims that only about 51 percent of all students who attend college will eventually complete a baccalaureate degree (Vocational Training News, 2000). Studies and statistics vary on the exact percentages of students who complete degree programs, usually depending on what programs (e.g., certification or license only, associate degree, baccalaureate) are considered. However, it is generally concluded that only about 50 percent of students who start in a U.S. college or university—and certainly those who attend state-supported systems—eventually will receive a baccalaureate degree (Kirst, 1998).

In reviewing public survey data and some government data bases and analyzing comments from position papers and interviews, a few conclusions seem obvious: (a) The public expects its high school youth to attend college and indeed more high school graduates continue to do so each year. (b) The public expects public high schools to prepare youth for employment. (c) Huge numbers of high school graduates are not prepared to be successful at four-year colleges, and large percentages (~50 percent on a nation-wide average) will drop out before completing a liberal arts baccalaureate degree or a professional program within six years. (d) Virtually all American youth should complete a solid, high quality education that includes some career and technical education through the equivalent of two years of postsecondary education.

Student Learning Motivation, and Achievement

As commented by Howard Gardner (1995), renowned Professor of Education at Harvard University, “We’ve probably learned more about the mind and how it works in the last, say, 25 years than has been learned in all previous systematic study” (p. 4). We simply know so much more today about how youth learn, think, remember, perceive, form associations, transfer knowledge, construct knowledge and meaning from new information, and apply knowledge to solve problems including those that are poorly structured and unfamiliar. We also know more today about how to structure curriculum and learning experiences for young people that build on our new knowledge of cognition. Further, we know more about how to motivate more students to continue to learn more. Our challenge, of course, is to figure out how to use this new knowledge to advance student achievement in schools and other learning environments (e.g., workplaces).

Businesspersons and educational researchers continue to say we must teach all students to new levels of higher-order thinking. This, then, is much of the impetus that undergirds the initiatives to integrate vocational and academic education in US high schools. It is important to teach youth how to think, not just what to think. Any definition of higher-order critical thinking skills include the ability to think creatively, make decisions, solve problems, visualize a solution, reason, analyze, interpret, and how to continue to learn. Critical thinkers draw on a variety of resources and disciplines to solve problems, use standards of performance as a benchmark, and are intermittently independent and group reliant for assistance.

Many recent theories and research on cognition and learning clearly support some of the pedagogical approaches historically used by career and technical educators—“learning by doing,” “heads and hands,” “theory and practice,” and cooperative

education. The theories and published works on multiple intelligence and how the brain processes information (Gardner, 1983), learning styles (Flannery, 1993; James & Gardner, 1995; Griggs, 1991; contextual teaching and learning (Borko & Putnam, 1998; Howey, 1998); out of school learning (Resnick, 1987); situated cognition (Brown, Collins, & Duguid, 1989); and constructivism (Lynch, 1997) are prominent examples. Conversely, career and technical education needs to set aside its historical reliance on an essentialist philosophy and habit psychology (Prosser & Quigley, 1950) that helped to shape pedagogy and practice throughout its history. The premise behind Prosser's essentialism is that education should train for specific jobs rather than train for culture and that the "right habits of doing and thinking are repeated to the point that the habits developed are those of the finished skills necessary for gainful employment" (p. 222).

In contrast to Prosser's essentialism of the 20th Century, the economy of the 21st Century clearly calls for thinking and *culture* into career and technical education. The learner needs to be able to make sense of the workplace and its context within that person's life. It isn't just "training" for specific jobs that is needed, but to make decisions, solve problems, find answers, and draw on a variety of disciplines and cultural contexts to make sense out of changes, challenges, and day-to-day operations at the workplace. Thus the learner (i.e., the worker) needs both the theory or the broad framework of that which underlies the mission and all aspects of that industry, as well as the company's and his or her role, responsibilities, and duties within the larger society. This leads to the integration of vocational and academic education, which may be among the most important recommendations emanating from US federal legislation and funding in the past decade.

School Reform

Nearly every individual or group interviewed commented that it is insufficient to reform only vocational education into a new career and technical education without major changes in public schools, especially high schools. Poll after poll, thousands of pieces of education legislation from the 50 US states, and cumulative analysis of writings of scores of educational journalists from the nation's top news magazines and newspapers all show that education, today, is the No. 1 concern of the American public. The National Conference of State Legislators expected school quality to top state legislative agendas in 1999 (Toth, 1999) and the high schools are thought to be a principal target for reform.

Several prominent education professional groups have theorized about or researched effective high schools. In synthesizing their work, common denominators for "outstanding" or "effective" high schools include (a) high academic standards; (b) a coherent core curriculum that integrates rigorous academic content with real-world applications; (c) authentic student assessment; (d) good human, equipment, governance and financial resources to enhance student success; (e) availability of school-supervised service- and work-based learning opportunities; (f) highly qualified teachers--the key to increased student achievement; (g) meaningful partnerships with parents, local or area colleges including community and technical colleges, business and industry, policy makers, social services, and other community groups; (h) a small-school or school-within-a-school environment where administrators and teachers know each student, often achieved with a team approach through an integrated professional, career, or applied major (American Association of School Administrators, 1999; Bottoms, Presson, & Johnson, 1992; National Association of Secondary School Administrators, 1996; Toth, 1999; U.S. Department of Education, n.d.).

Purposes of Career and Technical Education in the 21st Century High School

A “new” career and technical education is integral to reform of the American high school. The public demands and the students need relevant, contemporary career information, knowledge, and skills. Career and technical education is integral to whole school, comprehensive reform; it is not separate from it.

Drawing from recent research and literature and opinion, four purposes for high school *career and technical education* appear to be:

1. Providing career exploration and planning
2. Enhancing academic achievement and motivation to learn more
3. Acquiring generic work competencies and skills useful for employment
4. Establishing pathways for continuing education and lifelong learning

Themes and Components of High School Career and Technical Education in The 21st Century

There are four themes that were consistently discussed in the extant literature and that seemed to frame much of the discussion of career and technical education. These themes, or unifying representations about needed reform in high school career and technical education, were almost ubiquitous in conversations with educators, business persons, and policy groups:

1. Infuse career planning throughout the entire curriculum, from pre-K through lifelong learning. The essence of this theme is that all teachers (and parents) should be

cognizant of applications of knowledge to real-world environments, especially workplaces.

2. Ground career and technical programs in high school reform. Consistently, respondents spoke of the need to change the way in which high schools are organized, programs and curriculum are delivered, and students are taught.
3. Improve the image and upgrade 20th Century vocational education into a new and improved career and technical education for the 21st Century. Reform initiatives must be important and substantive.
4. Prepare high school graduates both for workplaces **and** continuing education. Many reports reviewed and most people interviewed for this project called for a 13th and 14th year as a minimum education benchmark for the next generation of American students.

Six components underlay the four themes and are focused on that which is thought to bring about improvements in students' learning, achievement, motivation, and performance to prepare them well for postsecondary education and for workplaces. Substantive changes in these components will involve careful attention to implications from further research and evaluation studies; much developmental work in curriculum, systems, and assessment; and vastly improved teacher education, counselor education, and school leadership development programs. Further the substantive changes cannot be developed and implemented by career and technical educators themselves, but will take significant partnering with other educators, business and industry, parents, and government agencies to prepare high school students well for employment **and** for postsecondary education.

High School Majors

Organizing high school curriculum into majors is conceptually similar to the liberal arts and professional fields that students choose in college around which to organize a program of study; choose specific courses including general, professional, and applied work; arrange internships and other experiences; complete term or senior projects; and collaborate with fellow students, advisors, faculty, and others involved with the major. It isn't just career and technical majors that would be provided to high school students, but focused study and related experiences might surround majors such as the performing arts, the liberal arts, technology, math and science, and teacher education. The applied subject matter and experiences should comprise about 10-20 percent—3 to 4 Carnegie units of credit, comparable to the number currently completed by a student concentrating or specializing in career and technical education—of the students' total high school curriculum. It is assumed that all high school students would select a major no later than the junior year or at about age 16.

The system of majors offered by a local high school would replace the current tracking and labeling system that typically identifies students as college prep, general, vocational, and special education. All students would select a major that presumably is compatible with their personal and career plans and whose interests align closely with the subject matter and experiences available through the major. Students from all majors would converge to study many academic subjects such as language arts, math, and science.

For career and technical education purposes, the majors available at any high school should be determined at the state and local levels. Policy groups and school

administrators should consider the following criteria for organizing career and technical majors:

1. A mission to provide the foundation for long-term employment and lifelong learning
2. High growth employment industries and occupations that offer high wages, good career opportunities for graduates, and a clear pathway to advancement
3. Requirements for a rigorous, coherent, sequenced program of study that includes high level academics, technology applications, recognized body of knowledge by industry standards, infusion of employability skills, work-based learning, and instruction in all aspects of the industry
4. Connections with business and industry
5. Connections with postsecondary education
6. Recognition at key points (e.g., high school graduation) with a transcript delineating accomplishments and/or a skill certificate based on valid and reliable assessments.

There are many examples of organizational schemata around career clusters or majors throughout the United States and in other countries known for their effective vocational and technical education systems. Examples include career and technical education program areas organized around eight broad economic sectors plus Technology Education from the National Board for Professional Teaching Standards, 15 economic sectors identified by the National Skills Standards Board, and 16 career clusters recently identified by the U. S. Department of Education. (For further discussion of these, others, and from other countries, see Hoachlander, 1998; Lynch, 1997). Obviously, many of

these programs or career cluster areas could be transited into bona fide high school majors using the above criteria.

Contextual Teaching and Learning

Contextual teaching and learning is a conception of pedagogy that requires educators to use instructional approaches to relate subject matter content to real-world situations that, presumably will help students apply this knowledge to their current future roles as students, family members, citizens, and workers. Drawing from various theoretical and development works, Howey (1998) and colleagues operationally defined CTL as follows

Contextual teaching...enables learning in which students employ their academic understandings and abilities in a variety of in and out of school contexts to solve simulated or real world problems, both alone and with others. Activities in which teachers use contextual teaching strategies help student make connections with their roles and responsibilities as family members, citizens, students, and workers, Learning through and in these kinds of activities is commonly characterized as problem based, self regulated, occurring in a variety of contexts including the community and work sites, involving teams of learning groups, and responsive to a host of diverse learners needs and interests. Further contextual and learning emphasizes higher level thinking, knowledge transfer, and the collection, analysis, and synthesis of information from multiple sources and viewpoints. CT&L includes authentic assessment, which is derived from multiple sources, ongoing, and blended with instruction.

Contemporary research on teaching and learning from the cognitive sciences underpin contextual teaching and learning. The essence is that most students need context to understand, learn, remember, and transfer knowledge. Much of the current contemporary developmental work in contextual teaching and learning is focused on seven instructional strategies: (a) problem-based learning, (b) project-based learning, (c) inquiry-based learning, (d) work-based learning, (e) service learning, (f) collaborative or cooperative learning, and (g) authentic assessment.

There was general consensus among all groups contributing to discussions of new directions in high schools that the pedagogy in schools needs to be vastly improved and that CTL should frame the instructional strategies. Much of CTL is, of course, compatible with historical and contemporary instructional practices in career and technical education. But nearly all groups felt that CTL strategies need to be incorporated more throughout the high school curriculum and certainly need to be included in the academic subjects as well. In fact, the general consensus seemed to be that academic subjects needed to emphasize far more career or real-world connections and that career and technical education needed to step up its theory base in classrooms to reinforce and strengthen the academics that must provide the foundation for applications in workplaces and other contexts. And, thus, the continuing thrust to *integrate* academic and applied instruction through contextual teaching and learning.

Work-Based Learning

A third essential component in improving and developing reformed programs of high school career and technical education is to design and include quality, work-based learning experiences as an integral part of the curriculum for all students with career and technical majors. Most educators and businesspersons also consider it important to

include work-based learning experiences for all students in workplaces related to other high school majors as well (e.g., the performing arts, math and science, technology).

Contemporary work-based learning is grounded in teaching and learning research emanating from the cognitive sciences, psychology, and pedagogy. Consistent with research from these various disciplines, work-based learning blends into an integrated curriculum the mental and tactile, theoretical and applied, and academic and vocational. This blending appears—for most students most of the time—to result in increased retention of knowledge, deeper understanding of subject matter, and the ability to apply (i.e., transfer) knowledge and skills in ill-structured environments. The effectiveness of blended classroom- and work-based activities also draws strength from the psychological and pedagogical principles underlying constructivism, contextual learning, the teaching of concepts and subjects through a variety of methods based on students' preferred learning styles, and authentic assessment. Much of what we know about effective work-based learning has been gleaned through research on learning and training in workplaces.

In 1995, the U. S. Office of Technology Assessment (OTA) described work-based learning as “learning that results from work experience that is planned to contribute to the intellectual and career development of students” (p. 3). It is critical to emphasize the *intellectual* development of students in that all school-sponsored activities must have solid education objectives and that the work experiences are *planned*. Based on OTA's study, some research studies emanating from the US School to Work office, and recent theoretical and applied work on contextualized teaching and learning, an operational definition of work-based learning has surfaced:

Work-based learning is an educational approach that uses workplaces to structure learning experiences that contribute to the intellectual, social,

academic, and career development of students and supplements these with school activities that apply, reinforce, refine, or extend the learning that occurs at a work site. By so doing, students develop attitudes, knowledge, skills, insights, habits, and associations from both work and school experiences and are able to connect learning with real-life work activities (Lynch & Harnish, 1998, p. 131).

Results from recent studies examining use of structured work-based learning approaches in education provide positive indication of its impact on student achievement, motivation, and educational continuation (Bailey & Merritt, 1997; OTA, 1995; Phelps 1998; Steinberg, 1998). In much of the research and evaluation studies, there appears to be a correlation between the positive student outcomes and the structure that the school and employers put into the work experiences. When the goals, school curriculum and work-site experiences, and staff support are well planned, implemented, and evaluated relative to the education and career goals and the integrity of the school program—and to some extent, vice versa with the place of employment—the outcomes for all are very positive (Goldberger, Kazis, & O’Flanagan, 1994; Lynch & Harnish, 1998; Steinberg, 1998).

Authentic Assessment

Several years ago, the US Department of Education estimated that American schoolchildren take 100 million standardized tests a year with an average of 100 multiple-choice questions, and thus they fill in 10 billion bubbles annually (Caudell, 1996). This is at a cost of at least \$200 million for these tests alone. Examples of the major tests typically used throughout the U. S. include the Stanford Achievement Tests known best as the Stanford 9, the Iowa Tests of Basic Skills, and the ACT and Education

Testing Service's SAT—used primarily by colleges and universities as one criteria for selecting “qualified” students to admit.

Compatible with the high standards rhetoric and legislated policies, many states are now actively developing their own tests of academic achievement. At least 24 states have recently introduced tests that high school seniors must pass in order to get a high school diploma. Related, 48 states are setting higher academic standards and 34 states have or are developing relatively high stakes tests in the earlier grades and/or high school subjects in the core curriculum (Chase, 1999).

What is perhaps most troublesome about the test mania is fourfold: (1) Much of the practice of standardized testing flies in the face of knowledge about student learning and effective teaching. (2) The bubbles on the tests don't always measure what youngsters need to know, the critical thinking they need to master, problems they ought to be able to solve, and the skills we—as a society—value that they acquire. (3) Standardized tests are not perceived by many segments of the population as fair in that, despite gains, women and minorities consistently under perform, especially on SAT scores. (4) Standardized tests are increasingly being used or taunted as the *only* measure that really count in assessing student achievement.

Career and technical educators need to posit forcefully for the increased use of multiple, authentic assessments to measure student achievement. It is not that we should argue that standardized tests of academic achievement are not appropriate, but that they are not enough. Compatible with Breaking Ranks: Changing an American Institution (National Association of Secondary School Principals, 1996), career and technical educators need to assure that high schools “assess the academic progress of students in a

variety of ways so that a clear and valid picture emerges of what [students] know and are able to do” (p. 54).

Examples of multiple assessments—and thus reflected on the students’ transcripts—typically include “scores” or evaluative commentary from portfolios, demonstrations, oral and written reports, work-based activities, student productions, term papers or projects, essays, student critiques of literary and technical work, standardized and teacher-made tests, employers and teachers formal and informal observations, case study analyses, and so forth. Assessments should represent a history (i.e., over time) of learning, organized progress of accomplishment, a direct and valid outgrowth of the standards and objectives set for the curriculum or learning event, and input from multiple human resources. Learners themselves should have input into the assessment processes and some selection of assessment instruments.

Increasingly, authentic assessments are being developed specifically from the knowledge and skills needed in workplaces. One prominent example is WorkKeys. Developed by ACT, WorkKeys provides assessment profiles of students’ skills in applied mathematics, applied technology, listening, locating information, observation, reading for information, teamwork, and writing. Another prominent example is from the Cisco Networking Academy Program which teaches, tests, and certifies high school (and college) students to design, build, and maintain computer networks. Certification is based on student mastery of industry standards through various computer-based demonstrations, design and network management projects, and internships. This arena of authentic, work-related assessment has great potential for measuring student achievement and should be advocated strongly by career and technical educators and included in their accountability reports to school administrators and policy groups.

Career Academies

Several business persons and educators interviewed and some recent studies support revitalizing US vocational high schools or regional vocational centers into career academies and changing names and descriptors accordingly. A high school career academy is typically a separate or distinct building near or distant from the comprehensive high school(s) OR a “school within a school” with a separate wing, floor, or section identified with the career academy within the comprehensive high school.

In reviewing recent descriptive and evaluative studies, it appears as though successful career academies (and, incidentally, those identified with the classical curriculum, as well) throughout the country have at least as many as five characteristics in common: (a) Clusters of students who share many of the same classes each day and have some of the same teachers from year to year; (b) sufficient depth and breadth of academic courses that meet high school graduation and college entrance requirements; (c) career and technical courses sufficient to comprise a career major; (d) work-based learning experiences built into the curriculum; and (e) a group of business persons who advise the school district on important components of the program such as curriculum, work-based learning, financial aspects, specific courses to offer, and equipment needs.

In current career academies, the teachers from both academic and career and technical fields usually teach the same group of students for two to three years, engage in group curriculum and program planning, collectively advise the students relative to career and education goals, and focus the curriculum around a particular industry. Typically, in today’s academies, about 50 students are enrolled in a particular major at each grade level. The academies are designed to ensure that their graduates are academically and technically proficient, have marketable job skills, and are academically prepared to enroll

in postsecondary education (Dayton 1999; Kemple 1997; Raby 1995; Stern, Dayton, & Raby 1998; personal interviews).

It is recommended that US vocational high schools or area/regional vocational schools consider transforming their current structures into career academies. This will need to be substantive transformation—not just a name change or curricular tinkering on the margins. To be successful these academies are going to have to be credible to their constituents (students, parents, community, businesses, higher education) and serve students successfully (i.e., prepare them both for college and for careers). A school-wide age-appropriate career development program, a rigorous program of studies surrounding career majors and a framework for tech prep, and implementing the characteristics identified with the currently successful career academies must underpin the development of these new 21st Century career academies.

Tech Prep

The original design for tech prep emanated from the thinking of Dale Parnell in his 1984 text, *Neglected Majority*. Parnell, known as the father of tech prep, called for a significant reform of vocational education based on his observation and some data that “voc ed” had been relegated in many high school systems as a track for the “educational have-nots” (Hull & Gravelle, 1998). Schools in general were neglecting the learning styles, academic needs, and goals of the majority of their students to concentrate resources and teaching methods toward abstract learners who, of course, were or should be college bound. The fundamental premise of tech prep was and is that all high school graduates are to be prepared with the foundations in both academic and technical course work to matriculate into postsecondary education and enter high skill/high wage

occupations. This, then, was to be the crux in the reform of vocational education and a cornerstone in the reform of K-12 public school curriculum.

Summarizing her years of research and that of others as well as some of the theoretical literature, Bragg (1995) from NCRVE identified six core concepts that formed and were continuing to form the basis for developing and implementing solid programs of tech prep:

1. Tech prep must be grounded in an integrated, authentic, and rigorous core curriculum at both the secondary and postsecondary levels.
2. There must be formal articulation between secondary and postsecondary schools.
3. Integrate work-based learning experiences into the curriculum.
4. Establish tech prep as a standards-driven, performance-based educational initiative.
5. Tech prep is to be an educational vehicle accessible to all students.
6. Collaboration among stakeholders is essential. (p. 299).

Today, the concept and design of tech prep seems to be in good standing with both the business and education communities. Nearly all interviewed for this project promoted the 2+2 plan to articulate high school and community college studies and wished for more collaboration between the two turfs. Effective tech prep programs that will result in improved student achievement, increased college attendance by more high school graduates, and a *solid* career and technical education for more youths will take time and commitment to develop from secondary and postsecondary stakeholders, considerable human and financial resources, and careful adherence to the concepts for tech prep as identified by Bragg (1995) and others.

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