Challenges and Opportunities for Technical and Vocational Education and Training (TVET) in the United States

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Introduction

In the United States, formal Technical and Vocational Education and Training (TVET) programs have been a part of the United States educational landscape for almost a 100 years, since the first U.S. federal legislation, the Smith-Hughes Act, was passed in 1917 to approve funding for these programs. In the United States, TVET is an elective form of education that students are not required to participate in to earn a high school diploma or a college/university degree. Historically, TVET has focused on job preparation for entry-level positions and is defined as educational courses and programs offered at less than the baccalaureate level.

About United States TVET

Technical and Vocational Education and Training in the United States is now commonly known as Career and Technical Education (CTE). The title Career and Technical Education replaced 'vocational education', which was thought to have many negative perceptions among students, parents, educators and policyholders, and has been a barrier to students enrolling in these courses and programs. This change occurred in 1998 (Association for Career and Technical Education, 2011). For the purposes of this paper, the authors will use the TVET terminology.

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TVET Students

Ninety-six percent of all high school students in the U.S. take at least one TVET course and one in four of all high school students take three or more courses in a single TVET program area (Levesque et al., 2008). One-third of all U.S. college students (4.9 million) are involved in TVET programs, generally in community and technical colleges. In addition, 40 million adults engage in short-term postsecondary occupational training or retraining (Levesque et al., 2008).

TVET Teachers

There were approximately 115,000 TVET teachers in grades 7–12 in the United States in 2009 (U.S. Department of Labor, 2009). These teachers are prepared through two different pathways. The first is based on a traditional route that includes a university degree, such as a bachelor's or master's degree and the second is an alternative pathway that provides pedagogical training (usually through a college or university) for TVET teacher candidates from various industries. There is presently a demand for TVET teachers, especially in areas of new, emerging technology.

TVET Program Areas

There are six broad areas of TVET. These areas are Agricultural Education, Business Education, Family and Consumer Sciences Education, Health Occupations Education, Marketing Education and Trade and Industrial Education.

Agricultural Education

Agricultural education prepares students for careers in agriculture and natural resources. It was one of the original areas funded under the Smith-Hughes Act of 1917, the first federal legislation written in support of vocational/career and technical education. The area of agricultural education includes courses and programs in animal production, food science, agribusiness, horticulture, natural resources, agricultural industrial equipment, green technologies and environmental science. According to the National Council for Agricultural Education (2009), over 800,000 students participate in formal agricultural education instructional programs in grades 7 through adult throughout the 50 states and three U.S. territories.

Business Education

Business education has historically been regarded as having a secretarial/office orientation, but with technological advances many programs are adapting and developing to meet the needs of the workplace. The area of business education now includes courses and programs in administrative office technology, accounting, legal office management, medical office management, business information systems, finance, information technology and business administration and management. Business and computer technology courses are the most common vocational/career and technical education offerings in public high schools.

Family and Consumer Sciences Education

Family and consumer sciences education is another original program area funded by the Smith-Hughes Act and has undergone significant transformation over the years. Since the early 1900's courses originally named domestic science and household arts have evolved to reflect the changing societal needs of individuals, families and communities.

Family and consumer sciences education now has a much broader mission, as defined by their National Standards. As a result of this broad mission, family and consumer sciences education contains programs that have a 'family studies' orientation, and may include courses and programs in subjects like personal development, resource management, life planning and nutrition and wellness. Other programs have a more traditional TVET focus and may include courses and programs in early childhood education and care, fashion, clothing and interior design, culinary arts and hospitality management. Many of the secondary programs also have articulation agreements with post-secondary programs.

Health Occupations Education

The health care sector is now one of the largest industries in the country, and health care is the most common major field of study among students in associate degree programs. As with business education, many of these programs begin at the high school level, with the expectation students will continue on to a 2-year college and complete an Associate Degree. The area of Health Occupations education includes courses and programs in nurse assisting, dental assisting, medical assisting, home health aid, patient care technician, fitness aide and athletic training and medical lab technician.

Marketing Education

The curriculum of marketing education has evolved from early beginnings that focused on providing cooperative training in retail store work to a focus on how

business plan, produce, price, distribute and sell the many products and services demanded by consumers around the world. Over 7,000 high schools in the U.S. offer marketing education courses and programs (Scott and Sarkees-Wircenski, 2008). Cooperative education that allows students the opportunity to participate in job shadowing, field trips and internships, has been a mainstay of marketing education since its beginning. The area of marketing education includes courses and programs in marketing management, e-commerce, acquisition and logistics, travel and tourism and entrepreneurship.

Trade and Industrial Education

Trade and industrial education (also referred to as vocational industrial education, technical education or industrial and engineering education) was the other original TVET program area designated for funding by the Smith-Hughes Act. The area of Trade and Industrial Education covers the broadest range of occupations found in a single TVET program area and includes courses and programs in automotive technology, carpentry, drafting and technical illustration, electrical trades, welding, precision machining, firefighter training and green construction. Many of these programs have been specifically targeted for job preparation since the occupations they cover have not required postsecondary education.

Initially, trade and industrial education programs were focused on entry-level employment, but the changing workplace and technical innovation have altered this mission to focus on postsecondary preparation as well. Programs within trade and industrial education often utilize a cluster approach in addition to specific occupational preparation. These programs and courses require the greatest attention to detail in the classrooms and labs because of the high cost of labs and equipment and the often-hazardous nature of the tools and materials used.

Where Can TVET Courses and Programs Be Found?

TVET courses and programs can be found in a wide variety of educational institutions in the United States. Students may be introduced to some TVET-related courses in the middle grades (6–8), but most of the significant courses and programs within TVET begin in various forms with entrance into high school, which in most states is grade 9.

Comprehensive High Schools

There are approximately 17,000 public and 6,300 private comprehensive high schools in the United States (Levesque et al., 2008). Technical and vocational education and training programs found in comprehensive high schools offer a wide range of courses, from general education to college preparatory, as well as traditional TVET courses. The specific course offerings and programs in these schools reflect the communities in which they are found. Comprehensive high schools in rural areas often emphasize TVET courses and programs in agricultural education and family and consumer sciences education, while schools in urban areas may be focused on programs related to business education, health occupations and marketing education.

Career Centers and Area Vocational Schools

There are approximately 900 high schools that are classified as vocational/career and technical education high schools in the United States (U.S. Department of Education, 2011a). These schools are usually located in large urban areas, such as Boston, Cleveland and New York City, and generally house students in grades 9–12. They are likely to be part of a larger, comprehensive school district which includes many comprehensive high schools as well.

In many states, the concept of 'area' vocational schools or career centers has been developed. These schools are designed to serve students from a specific geographical area and from several high schools. The students are usually only in grades 11–12, rather than the 9–12 approach used in vocational/career and technical high schools. Because the schools focus on TVET and serve a large area, they can achieve economies of scale and are able to offer courses and programs to a large number of students that a single comprehensive high school or vocational/career and technical education high school would find cost-prohibitive. Typically, students in these area schools and centers spend one half of the school day in their TVET program area and the other half in academic courses such as math, language arts and natural sciences, that are usually required for graduation from high school.

Job Corps Centers

Job Corps has centers in over 120 locations across the United States and serves more than 100,000 students (U.S. Department of Labor, 2011a). Job Corps centers offer

career development and training services to young men and women ages 16 through 24 to prepare them for successful careers. These individuals may be high school dropouts, or adjudicated youth (under a court's jurisdiction) and are seeking an opportunity to earn a General Equivalency Diploma (GED) or actual high school diploma, along with marketable technical skills. Job Corps centers offer academic courses, vocational training, and teach employability skills and social competencies and primarily focus on programs in the building trades.

Community and Technical Colleges

One-third of all college/university students are involved in TVET programs in 2-year, associate degree-granting institutions (Levesque et al., 2008). In addition, several million adults engage in short-term postsecondary occupational training at these institutions every year. Students can take courses and programs offered at the Associate Degree level as well as a broad range of non-degree offerings, such as continuing education programs, occupational certificate programs and custom designed courses. Many students in 2-year institutions enroll specifically for vocational-technical training, with no desire to earn a degree.

Similar to secondary education institutions, TVET courses and programs at community and technical colleges also tend to reflect the communities in which they are located. In addition, these postsecondary educational institutions continually look for opportunities to expand their mission by entering into partnerships with 4-year universities and comprehensive high schools or vocational/career and technical education high schools through articulation/transfer agreements, providing job retraining opportunities for displaced workers. Two-year institutions have embraced the use of technology to offer courses and programs via distance education methods as a way to expand their reach, especially to older, working adults (Zirkle and Fletcher, 2009). These institutions can be public (funded largely by the state government), private or proprietary (for-profit).

Youth and Adult Prison and Correctional Facilities

TVET programs are offered at prison and correctional facilities to both youth and adults as a way to reduce recidivism, or the tendency of inmates to relapse into a life of crime after release from prison. Vocational training and other special programs designed to train participants for jobs can be found in more than half of state prisons and 90% of federal prisons in the United States (Wolf-Harlow, 2003). Some com-

mon areas of vocational training in these facilities include automobile body repair, electronics, horticulture, masonry, refrigeration servicing and welding (Lewis et al., 2002).

Apprenticeships

While perhaps not as well-developed nor as popular as in other countries, apprenticeships in the United States are a combination of on-the-job training and related classroom instruction that provide workers with the practical and theoretical aspects of a highly skilled occupation. These programs have been in existence since 1937, and are now overseen by the U.S. Department of Labor, which offers apprenticeship programs in a variety of training programs such as carpentry, plumbing and electrical trades. Employer and labor groups, individual employers and/or employee associations jointly sponsor apprenticeship programs. There are currently more than 28,000 active apprenticeship programs serving more than 460,000 apprentices across the country (U.S. Department of Labor, 2011b).

Significant TVET Challenges in the United States

TVET in the United States is currently facing some considerable challenges. For the purpose of this chapter, we will focus on four of these challenges, and then we will follow up with a discussion of the potential opportunities that exist within these challenges. The four challenges are:

- Public perceptions of TVET
- Curriculum issues
- Funding of TVET
- The development, recruitment and retention of quality teachers for TVET programs.

Public Perceptions of TVET

Many parents, educators and policymakers in the United States see TVET as a 'second-class' educational system, only for students who cannot succeed in academic endeavors. At present, there is much focus on the U.S. on a 4-year

college/university education, and TVET is not seen as a pathway to success. As a result, parents tend to focus on 4-year university degrees instead of encouraging their children to pursue TVET courses and programs. In addition, as a result of this mindset, some TVET programs are populated with students who have not been successful in previous academic pursuits and while TVET can be a salvation for some, others still struggle.

Presently in the United States, there is much policymaker focus on accountability and performance of U.S. schools, teachers and students. Until recently there has been a lack of conclusive research evidence as to the benefits of TVET courses and programs at the secondary level, which has only added to negative perceptions of the discipline.

Curriculum Concerns

In the U.S., TVET as an educational discipline lacks a consistent mission or goal. Currently there are multiple missions for TVET, including a focus on entry-level job preparation, adult retraining programs, college/university preparatory coursework, postsecondary options and 'second-chance' opportunities for individuals convicted of crimes, or for high school dropouts. Meeting the needs of these multiple missions is a difficult task for TVET as a whole.

In addition, there is an increasing emphasis on the traditional academic disciplines within the United States secondary educational system, as a result of the singular focus on a college/university education. This is contributing to the detriment of TVET. In the U.S. secondary school system, students have limited opportunities to take TVET courses as their school schedules must include more math, natural science and social science courses in order to meet graduation requirements. For students who wish to complete TVET programs comprised of series of multiple courses, these changing requirements for graduation have made it more difficult to achieve this goal, and have caused many schools to discontinue many TVET course and program offerings.

Funding of TVET Courses and Programs

Because of the technical nature of TVET programs and the heavy reliance on technology and other equipment, these programs are expensive to offer and maintain. Funding for TVET comes from a combination of federal (U.S.), individual state and local (tax) sources. At the federal level, funds from the Carl D. Perkins Career

and Technical Education Improvement Act (the present-day version of the Smith-Hughes Act of 1917) provides about 8–10% of the operational costs associated with a local school offering TVET courses and programs, totaling about $1.1 billion USD per year in funding (U.S. Department of Education, 2011b). However, this federal funding for TVET has not increased for 20 years, and was recently reduced from a yearly average of approximately $1.3 billion USD. In addition, each of the 50 states received a portion of the federal funds, and also funds TVET at different levels through state revenues, resulting in differences in course and program quality between the states. Finally, funding for U.S. schools relies significantly on local tax revenues. In the present economic climate, local levels of financial support are challenged to adequately support TVET programs. Coupled with the current emphasis on the academic disciplines in U.S. secondary schools, many TVET courses and programs across the country have been reduced in number or eliminated.

Within the challenge of funding issues, and the ability of various government structures to financially support TVET, historically, business and industry has not been a key partner with educational institutions. Financial support, equipment/material donation, opportunities for students to serve internships and apprenticeships and the overall involvement of the U.S. private sector with TVET activities has historically been limited. This has been a significant challenge toward the improvement of TVET courses and programs.

TVET Teachers

As with all areas of education in kindergarten through grade twelve (K-12) in the United States, TVET teachers are not well paid and the occupation of teaching is not a prestigious one. These facts make it difficult to entice college/university students to become TVET teachers, and to recruit qualified and talented individuals from industry to be TVET teachers. In all secondary teaching fields, the issue of retention of teachers is a significant problem. Many studies have shown that as many as 50% of first-year teachers leave the profession within five years (Ingersoll, 2003; Jalongo and Heider, 2006; National Commission on Teaching and America's Future and NCTAF State Partners, 2002).

While some traditional academic disciplines are not affected by changing technology, within TVET, almost all of the areas of study are impacted by continual technological advances. It is difficult for TVET teachers to obtain technical skill upgrades when they are in the classroom with students, and many schools do not have the financial resources to send their TVET teachers to professional development opportunities, such as technical update training.

Finally, teacher preparation programs for TVET teachers are declining in number at the college/university level. This phenomenon has been taking place over the past 20 years and has been documented by several studies (Bruening et al., 2001; Gray and Walter, 2001; Hartley et al., 1996; Lynch, 1991; Ruhland and Bremer, 2002; Zirkle et al., 2007). Many universities receive federal Perkins funding to operate, and since that funding has been stagnant for 20 years, it is difficult to offer programs.

Significant TVET Opportunities in the United States

The same issues that are currently presenting challenges for TVET in the United States are also offering significant opportunities for policymakers, educators and administrators.

Public Perception Opportunities

A substantial number of educators and policymakers have suggested situating TVET as the center of school reform in the United States. While there is still much debate on the core mission of K-12 education in the U.S., many believe, for the country's economic prosperity, sectors such as manufacturing and construction must thrive, and TVET courses and programs are a key component and contributor to these employment sectors. Recent publications, such as Harvard University's *Pathways to prosperity: Meeting the Challenge of Preparing Young Americans for the 21st Century (*Symonds et al., 2011) and The Heldrich Center's *Unfulfilled Expectations: Recent College Graduates Struggle in a Troubled Economy* (Godofsy et al., 2011) point to the need for multiple educational options and opportunities for America's young people.

On a positive note, some strands of research, including what is produced by The National Center for Career and Technical Education (NRCCTE), are beginning to confirm the benefits of secondary school TVET programs for students. For example, recent research has confirmed that TVET involvement motivates students to stay in school and can possibly help keep them from dropping out (Plank et al., 2005). In addition, TVET graduates earn more and are more likely to be employed upon graduation than students who complete a general-track education (U.S. Department of Education, 2004). Students at schools with highly integrated, rigorous academic and TVET programs have significantly higher student achievement in reading, mathematics and science than do students at schools with less integration between the

programs (National Research Center for Career and Technical Education Curriculum Integration Workgroup, 2010).

These research studies, the present status of employment in the United States (many unemployed or under-employed and a significant need for skilled labor), along with the overall state of the economy in the U.S., have caused many educators and policymakers to re-evaluate the role of TVET within the country's educational system.

Curriculum Opportunities

As previously mentioned, TVET programs have expanded their focus from the historic mission of entry-level job preparation to include college/university preparation, adult retraining and second-chance educational opportunities. This has resulted in some very innovative educational approaches. For example, some high school TVET programs offer both high school and college/university credits in a 'dual-credit' arrangement. Many high school TVET courses and programs are 'articulated' (linked) to TVET programs of study at 2-year community and technical colleges. These agreements between educational institutions are designed to encourage TVET students to continue their education past high school and earn an industry credential, an Associate Degree, or both. Still other TVET courses and programs have been revised to reflect 'career academies', a broader-based curricular approach that includes entry through professional-level occupations within an industry cluster. This curricular approach provides instruction within a family of occupations rather than focusing on one in particular. Another new approach is pre-apprenticeship programs, designed to introduce the basics of a trade to a student with little or no experience in that specific industry. The program covers basic tools, materials and the work ethic needed for the occupation, with the potential goal of the student desiring to apply to a registered apprenticeship program.

Finally, despite funding cutbacks, increased academic course requirements for high school graduation, the U.S. single-minded focus on a college/university education, and a host of other challenges, the number of students enrolled in TVET courses and programs has risen 157% since 1999 (Levesque et al., 2008).

Funding Opportunities

There is a renewed interest in education and training for TVET in the United States, resulting in part from a shortage of skilled workers, and the realization that 4-year

university degrees are not the only pathways to success (Balderrama, 2011; Symonds et al., 2011). While specific federal funding for TVET from the Carl D. Perkins Career and Technical Education Improvement Act has not increased, other initiatives such as those for Science, Technology, Engineering and Mathematics (STEM) education are beginning to involve TVET in the funding models. Some of these efforts are at the federal level, but many of these initiatives are being developed by individual states searching for ways to implement activities integrating STEM into K-12 instruction. At the local school district level, individual schools are also trying to shift some financial resources to the aforementioned career academies, pre-apprenticeship programs and other efforts focused on TVET and STEM activities.

With respect to private sector involvement of business and industry, there have been significant strides made in this area. The primary professional association for TVET in the United States, the Association for Career and Technical Education, has been very involved in the development of industry advisory groups to encourage partnerships between TVET providers and corporate entities. In addition, various organizations and professional industry associations have supported TVET initiatives at various levels, and have included Ford Motor Company, Apple Computer, Toyota Motor Corporation, the National Association of Manufacturers, and the National Council for Advanced Manufacturing, the National Skills Coalition and many others.

Teacher Opportunities

The employment of TVET teachers is expected to grow by 9% from 2010 to 2018 (U.S. Department of Labor, 2009). Individuals seeking to find employment as TVET teachers will be in demand, especially in newer 'hi-tech' fields such as biotechnology, green construction and exercise science.

With respect to compensation, while teachers in the United States are not paid well relative to other professions, on average TVET teachers are paid salaries equal to or sometimes greater than their counterparts in academic disciplines. This is due in part to the need for schools providing TVET courses and programs to remain competitive with the private sector salaries paid to technically skilled workers.

While teacher preparation programs are generally declining, they can still be found in a variety of colleges and universities. Large, research-focused, state supported institutions such as the Ohio State University, the University of Georgia and the University of Minnesota have TVET teacher preparation programs that date back several decades. State supported institutions with a focus on teacher prepara-

tion, including Ball State (Indiana) University and Northern Illinois University are another source of traditional and alternative TVET preparation pathways. Finally, privately funded institutions such as Ashland (Ohio) University and Brigham Young (Utah) University offer additional options for TVET teacher preparation. Many of these colleges and universities are collaborating and utilizing distance education to deliver teacher preparation courses and open opportunities for more potential TVET teachers (Zirkle, 2003).

Conclusion and Summary

Formal, federally-supported TVET courses and programs have been part of the United States educational system for almost 100 years and will likely continue to play a role in the future, despite the numerous challenges listed in this chapter. TVET is a multi-faceted educational discipline, and offers many different opportunities to all types of students, in part due to new curricular approaches that provide various other options for students in addition to the historical focus on preparation for entry-level employment. In turn, these new approaches to TVET have altered some of the negative perceptions regarding the role of TVET in the United States.

As the United States seeks to retain its standing in the global marketplace, reliance on TVET to provide skilled worker training will be a key piece of that effort. In addition, as educators and policymakers seek to find ways to engage students in the classroom and laboratory, TVET has shown it can play a role in that effort as well. TVET in the United States may no longer be relegated to second-class status.

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