Embassy
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Washington

Skills Initiative

THE SKILLS INITIATIVE:
Expanding Apprenticeship in the U.S.—
Lessons from the German Dual Education System

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SKILLS INITIATIVE

The “German Skills Initiative” was publically announced by the German Embassy on May 16th, 2012 at a conference in Washington, DC. The conference was hosted in conjunction with the Aspen Institute, the Representative of German Industry and Trade and the German Center for Innovation and Research. At the conference, Deputy Secretary of Commerce, Dr. Rebecca Blank, endorsed the goals of the Skills Initiative. Many German companies participate in the Skills Initiative. This “White Paper” is for the benefit of all stakeholders interested in implementing the German Dual Education System in their communities. It is written by practitioners for practitioners. It addresses the “how to’s,” as well as the obstacles to expect.

For more information, please visit www.Germany.info/skillsinitiative

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Lessons from the German Dual Education System

A White Paper prepared for the German Embassy

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RECOMMENDATIONS

The German dual system offers an excellent approach to skill development, links between education and career, youth employment, and occupational competence and identity. Like Austria and Switzerland, which have similar dual systems, Germany achieves low youth unemployment and high level skills and careers for workers without university education. At the same time, German employers benefit from sponsoring apprentices by the productivity of the apprentices, reduced recruitment and specific training costs, and enhanced innovation.

In recent years, researchers, policymakers, and U.S. employers have come to recognize that dealing with skill shortages requires improving how workers develop occupational and employability skills to enter careers. For this reason, they have become interested adapting aspects of the German dual system or apprenticeship. Already two states—Georgia and Wisconsin—have youth apprenticeships that resemble the dual system, but at a modest or low level. In other states, notably in Maryland and Minnesota, legislation is taking place that would establish sustainable elements of the dual system. This paper looks at the rationale for, and examples of, successful implementation of apprenticeship in the U.S. In this section, we consider a number of recommendations for widening the role of apprenticeship in the U.S.

WHAT IS THE GERMAN DUAL EDUCATION SYSTEM AND THE GERMAN SKILLS INITIATIVE?

Germany has a long history of apprenticeship programs. But, only in the 1960s did the Confederation of German Trade Unions, employer organizations and the German government start to develop a close collaboration that resulted in what has become known as the German Dual Education System. The Vocational Training Act of 1969 began this tight-knit alliance between the German government, the German education system and industry to work together to devise a combination of academic theory and practical work experience for over 330 occupational standards that are modified each year based upon changes of technology, working environments and customers needs.

Employer organizations, above all the Deutsche Industrie und Handelskammer (DIHK, German Industry and Trade Chamber) and trade unions, are the drivers when it comes to update and create the changes to training manuals, curriculum and standards throughout Germany, so that training, testing and certifications are standardized for each of the 330 occupations in all industries throughout the country. This assures that all apprentices obtaining certifications in any of these 330 occupations receive the same training wherever she/he may take it in Germany, no matter what location, and no matter what company. When going through an apprenticeship in Mechatronics at Siemens or BMW, everybody will receive the same training and testing regardless of the location or company, and will be qualified to work at either of these companies, or any other company requiring workers certified in Mechatronics.

Though there are standards, training manuals, curriculum and certifications in the U.S., very few of them are as robust, thorough or up-to-date in technology or standardized methodically from year to year as the German standardized dual education system. The German system assures the apprentice will be trained with the latest technologies available. The German system has built a strong reputation as an important part of the educational system.

In 2011, 540,000 new apprentices entered contracts with employers (Saniter and Deitmer 2013). Although the ages of the apprentices vary, we can estimate the penetration by age group by dividing the number entering apprenticeship by the number of people at a single age, say 18-year-olds. By this measure, 63 percent of a German cohort starts an apprenticeship.

The "German Skills Initiative" was officially launched on May 16, 2012 by the German Embassy. The Skills Initiative seeks to engage German companies in the U.S. as pioneers in implementing appropriate elements of German style dual work force training in their communities in the U.S. By convening companies and U.S. training stakeholders in specific areas and encouraging them to cooperate more closely, the embassy wants to spread best practice in work force training and scale up successful projects. Stakeholders are encouraged to consider the following areas for cooperation: projecting local demand for trainees (how many, which skills?), devising a curriculum, setting up training facilities, establish some form of apprenticeship (training in a company and in school), marketing of this type

of training and German-American agreements on mutual recognition of training certificates.

Obviously the Skills Initiative is not meant only for German companies. They are merely the natural pioneers, because they are spread through all industrial regions of the country, they are accustomed to dual style work force training from home and the merits of the Skills Initiative are obvious to them. Other companies are invited to join the Skills Initiative – regardless of their ownership. Only if there is a critical regional mass of participating companies can the desired scaling up of best practice be achieved.

Many Americans and American companies have asked the question "why is Germany promoting the German "Skills Initiative." The answer is straightforward. Finding and retaining workers with the right skills is the number one challenge for German companies operating in the U.S. This is so in particular for companies engaged in manufacturing. So, German companies are helping themselves when they introduce a more demand driven system of work force training. But this is a "win" for all stakeholders. The trainees benefit, as do other companies in the area, the local community and the state. Finally, Germany and the U.S. are great friends and allies. We share the same values and our partnership is essential for global stability and prosperity. Our economic relationship is central. Trade and investment across the Atlantic are central to our success. No two other markets in the world are as linked by intra-company trade, cross investment and long value chains as they exist across the Atlantic. German companies thrive in the U.S., as U.S. companies thrive in Germany and Europe. Many companies have formed global networks with company sites spread across the globe for specific purposes.

The Skills Initiative is taken in the spirit of German-American friendship and the value that friendship has for the world: What is good for the U.S. is good for Germany and vice-versa.

The Skills Initiative does not aim to copy the German system to the U.S. That is not possible due to the historical and systematic differences between the U.S. and the German education system.

What we can do, however, and what is recommended in this paper, is that we study the German Dual Education system and learn where it can provide us insight into developing successful pilots within our communities where we can reach beyond the boundaries of the public school system, while simultaneously working in unison with them to fill the voids discussed earlier. We can accomplish this together through an innovative partnership between all the stakeholder groups, but it is absolutely essential that manufacturing be the driving force to develop a fully robust training curriculum based upon the successful German Dual Education system. However, unions are also natural partners in improving the quality of employment at the local, regional and federal level. They have an interest to see that workers are equipped with appropriate skills to the sectors and are trained with the skills that will qualify them for high-demand jobs.

WHY EXPAND APPRENTICESHIP TRAINING IN THE U.S.?

Although the U.S. has outpaced the original 15 European Union countries in GDP growth over the

last two decades, the U.S. confronts several socio-economic challenges for the foreseeable future. They include high youth unemployment, high levels of economic inequality, a hollowing out of middle class jobs, rapidly escalating college and other education costs, weaknesses in reading and math skills in the adult population, and an apparent mismatch between the skills employers seek and the skills workers possess. Stagnant wages among men without college degrees and rising unmarried parenthood among high school graduates with little or no college education represent additional challenges. Labor force participation has been declining among men at middle levels of education and at prime working ages. As of early 2013, 22 percent of these prime-age men were not employed. Since joblessness is associated with negative family outcomes, helping young people obtain better jobs and earn more are critical tasks for this generation and for the welfare of the next generation.

Meanwhile, employers cite the employer reports of worker shortages in skilled trades and in a range of middle-skill occupations. Reports of worker shortages have been striking in an extended period of high unemployment. In a 2013 survey of executives of 400 large companies, nearly half said they were concerned about having sufficient skilled workers to meet their demands. Among this group of companies, two-thirds are worried about a loss of sales, 59 percent about eroding customer satisfaction, and 53 percent about a delay in developing new products (Accenture, 2013). A 2011 Manpower Group survey indicated that more than half of employers had difficulty filling jobs and nearly half blame the lack of hard, technical job skills. A typical example is Marlin Steel Wire Products, a company in Baltimore with 30 employees, that reported not finding sufficient qualified workers to maintain high levels of growth, despite offering a compensation package of more than $80,000 per year (Weitzman and Harding 2011). A 2011 report prepared by Deloitte for the Manufacturing Institute stated that two-thirds of companies had a moderate to severe shortage of available, qualified workers, a problem expected to worsen in the coming three to five years. These manufacturing companies expected their greatest hiring challenges to take place among machinists, craft workers, technicians and other skilled production workers.[1]

The primary policy focus for dealing with the limited skills of the U.S. work force is on improving academic skills and raising educational attainment. Yet, despite spending already a higher share of its GDP than other OECD countries, U.S. students rank below average on the basis of international tests of math, reading and problem-solving. Educational attainment is weak as well. Over one in five youth drop out of high school and about 80 percent of students who start two-year public colleges fail to complete their programs within 150 percent of the normal time. College graduate rates have stagnated, leaving the U.S. well behind other countries. The weak outcomes and high cost of higher education for government, parents, and students are raising serious questions about the viability of the nation's implicit "College For All" strategy in the U.S. One recent commentator argued that "...college-for-all has been a major blunder. One size doesn't fit all... The need is to motivate the unmotivated. One way is to forge closer ties between high school and jobs."

[1] The report is available at: http://www.themanufacturinginstitute.org/~/media/A07730B2A798437D98501E798C2E1eAA.ashx

Expanding apprenticeship can play a key role in reducing the skills gap, raising the earnings and productivity of workers without a BA degree, and making our labor market more flexible. It can play a key role in reducing youth unemployment and wage inequality. Apprenticeships train people by combining work-based learning with classroom instruction in a unified program that leads to a recognized and valued occupational credential. Young people, especially young men, who dislike sitting through classes all day can spend part of their time making something, learn how and why to do things, and seeing an immediate application of their course work. They become experts. Trainees earn money and contribute to production and revenues while they learn. Apprentices graduate with a sense of pride and identity as a member of a community of practice. Mentoring is built into the apprenticeship process, with employers and trainers having a real stake in the young person's success. Apprenticeships help young people gain mastery in an occupation as well as other workplace skills. And they are extraordinarily cost-effective for the government, the student, and even the participating firms.

The gains for workers are substantial. Many European studies of earnings gains from apprenticeship find high rates of returns to the workers, often in the range of 15 percent (Clark and Fahr 2001; Fersterer, Pischke, and Winter-Ebner 2008; Geel and Gellner 2009). Moreover, the gains are only modestly lower when apprentices shift from the training occupation to another, often related, occupation. The benefits for workers extend to the adult, mostly construction-oriented apprenticeships in the U.S. In a broad study of apprenticeship in ten U.S. states, Reed (2012) estimates impacts that are consistently and highly positive. Six years after starting a program, earnings of the average apprenticeship participant (average duration in an apprenticeship) stood at 1.4 times the earnings of non-participants with the same pre-apprenticeship history.

Moreover, these benefits come either at a low cost or an actual gain to the government. The Reed study finds that apprenticeship returns nearly $28 in benefits for every dollar of government and worker costs. A study conducted for Washington State's Workforce Board finds that taxpayers net almost three times their spending on apprenticeships within two and a half years of the program's completion, and the combined benefits accruing to participants and taxpayers are about five times the costs. By the time former apprentices reach age 65, benefits to taxpayers reach $23 for each dollar spent.

While no rigorous evidence is available about the apprenticeship's costs and benefits to U.S. employers, research in other countries indicates that employers gain financially from their apprenticeship investments (Lerman 2014). Firms reap several advantages from their apprenticeship investments. They gain from apprentice's contribution to production and they save significant sums in recruitment and training costs, reduced errors in placing employees, avoiding excessive costs when the demand for skilled workers cannot be quickly filled, and knowing that all employees are well-versed with company procedures. One benefit to firms rarely captured in studies is the positive impact of apprenticeships on innovation. Well-trained workers are more likely to understand

the complexities of a firm's production processes and therefore identify and implement technological improvements, especially incremental innovations to improve existing products and processes. A study of German establishments documented this connection and found a clear relationship between the extent of in-company training and subsequent innovation (Bauernschuster, Falck, and Heblich 2009). Studies of apprenticeship programs in Germany and Switzerland find that employers are able to recoup all or virtually all of their investments during the training period.

Despite the low government cost and high returns to workers and firms, today apprenticeships make up only 0.2 percent of the U.S. labor force, far less than 2.2 percent in Canada, 2.7 percent in Britain, and 3.7 percent in Australia and Germany. In addition, government spending on apprenticeships is tiny compared with spending by other countries and spending on less effective career and community college systems providing education and training for specific occupations. While total government funding for apprenticeship in the U.S. is only about $100-400 per apprentice annually, federal, state, and local government spending annually per participant in two-year public colleges is approximately $11,400 (Cellini 2012). Further, apprenticeship in the U.S. rarely reaches the 17- to 19-year-old age group that is so prominent in the German dual system.

The historical reasons for apprenticeship's low penetration in the U.S. are less important than the potential for future expansion. Recent experience in Britain and in selected areas in the U.S. suggests grounds for optimism but the barriers to expansion are significant. The rest of this report examines the feasibility of adopting elements of the German dual system of career-focused education in the U.S. context.

OBSTACLES WITH POLITICAL, EDUCATIONAL, INDUSTRIAL AND PUBLIC STAKEHOLDERS

There are four main community stakeholders that need to be equally committed to implementing the German Dual Education System. Buy-in from these four groups is absolutely essential, but nearly impossible to align. In fact, the effort to actually implement the German Dual Education system (or even a hybrid version) is so daunting and exhausting a task that many individual German manufacturing companies give up on their desire to try to improve the pipeline of human resource capital within their company and local community that they usually give up the task, bring in the required talent from Germany (at great expense) to retrain their existing American workers as best as they can, and in the meantime, lose valuable time and profitability and potential growth in market share.

Typically, the small- to medium-sized German company in the U.S. will give in to the frustration of trying to explain the dual system and throw in the towel. They find that due to the lack of understanding within the community, the same message has to be repeated over and over to each independent stakeholder to the point of exhaustion.

The fact is that the American and German systems are so different that a single small- to medium-sized (Mittelstand) German company with all good intentions, cannot single-handedly change the American system and will make very little headway

among all of the stakeholder groups that need to be approached, unless the German company can combine efforts in a consortium with other like-minded local companies (German ones are natural candidates because they understand it, but also American companies who recognize the need and accept the challenge). Typically, with few exceptions (unless you are a mega company the likes of BMW, Siemens or VW, a consortium of like-minded small- to medium-sized companies is the cornerstone to the most successful models implemented in America. This will be discussed in more detail later in this paper.

The task of simultaneously aligning all four stakeholder groups is the most difficult task for any community to overcome, because when you start this initiative there is everything from territorial turf wars to apathy and numerous other obstacles that arise.

So let us identify the pillar stakeholders in a community and then discuss what common obstacles arise in the path to impede the progress of implementation of the German dual education system. These four stakeholder groups are:

- Industries (often manufacturing is the lead industry cluster in the region), including business managers and workers, either through unions or other entities
- Government, policy makers and economic development corporations (EDCs) (local, state, regional and federal)
- Educational institutions (K-12 including all types–home, private, charter and public, school districts), community colleges, vocational-technical institutions (vo-tech) and universities
- Parents, students, teachers and the general public

INDUSTRY SECTORS AND FIRMS

The most important of all stakeholder groups are employers, with manufacturing often in the lead. Unless those who feel the same demand, do not align to pool their resources, the message to all other stakeholders becomes fragmented. Industry needs to take ownership of the workforce development issue and drive it! But what about small- to medium-sized businesses? Ideally, companies should reach out to other companies within their own industrial park, especially those with similar workforce training needs, and form a consortium of like-minded businesses. In the case of advanced manufacturing firms, it is usually a quick task to figure out what skill sets are commonly required and lacking in the community. Once firms work within their local area and have a small band of companies seeking the same training, they can more readily combine forces with local, regional and statewide industry associations to form an even stronger alliance of companies to support your local consortium and to speak now as one voice to policy-makers and educators.

Within the manufacturing stakeholder group, there has to be a strong alliance of companies that are ready to take on interns/apprentices starting at the high school age of 16 and willing to make a three- to four-year commitment to that student as an investment. For the program to succeed, many firms must participate and commit to the program. Ultimately, the long term goal is to put as many students through the apprenticeship dual education and training experience as possible, so they can make sound decisions based on experience at the workplace, rather than based only on classroom

knowledge. The internship/apprenticeship experiences will enable students to discover their career passions, influence their lifetime career decisions, and ultimately affect their happiness and satisfaction in the workplace.

Manufacturing firms often encounter several drawbacks and obstacles to implementing a dual system approach, such as:

- Small and medium German manufacturing companies in the U.S. usually do not have the staffing to support a public campaign to reach all stakeholders.
- Individual manufacturing companies usually do not have the need to hire as many people required by community colleges and vo-tech institutions (a minimum of 10 to 12 students) to justify the expense of a special training class.
- Companies are profit and loss companies, so their flexibility is limited to what they can invest in training, and when the economy drives their employee expansion needs.
- When a company needs a given high-tech skill set, their need is immediate, and they cannot afford to train a worker who is too far behind the learning curve and to wait for that worker to catch up.
- Few small- and medium-sized manufacturers are plugged into local manufacturers associations, the local workforce or economic development boards or any other trade organizations because they are understaffed and cannot find the time to break away from their immediate task at hand that is always customer and/or product delivery driven.
- The last point is also true when it comes to becoming involved in local high schools, community colleges or university internship/ apprenticeship programs.
- Manufacturers are generally poor communicators to education about what their needs are because it is usually only a handful of employees at one time for a short term need in a specific skill, and it is hard to gauge how many workers they will need long term. This makes it difficult for the educational institution to justify the purchase of equipment and training materials, to seek the right instructors for the training, and to fill the classes with students.
- Manufacturers are reluctant to hire high school students for workshop apprenticeship training at 16 years old due to liability issues.
- Manufacturers must be willing to dedicate at least one person on staff to be accountable for the success of the apprenticeship training program and to manage the interns and apprentices.
- Unionized firms can benefit from partnering with their unions; both workers and management have an interest in seeing that workers are highly skilled and can justify high wages.

Unions are also natural partners in industry and firms in improving the quality of employment at the local, regional and federal level. They have an interest to see that workers are equipped with appropriate skills to the sectors and are trained with the skills that will qualify them for high demand jobs.

GOVERNMENT, POLICYMAKERS AND EDC's

These parties make up the second most important stakeholder group required to lead the initiative. Aligning the regional EDC'S and community

governmental stakeholders (county, state and federal) is critical. Manufacturers and other firms should engage with policymakers and educate them about the German dual education concept and the potential benefits in the U.S. for students, firms, and the government. Employers and government policymakers must agree and align forces in order for elements of the system to become a reality. The regional workforce boards are a crucial component, because they marry the business work force training needs with the training dollars allocated by the state and the educational institutions who provide the training. Workforce boards are usually the entities listening closest to the needs of the community manufacturers, and trying their best to accommodate them. However, workforce boards often lack the tools to meet the technical training needs of companies, especially in manufacturing.

Several obstacles tend to arise that limit government support for a dual system initiative:

- U.S. local, state and federal policy makers are unfamiliar with educational models outside of the U.S. and specifically cannot grasp the complexities of the German Dual Education System. Many harbor false preconceptions about the German system.
- Few manufacturers and other employers have time to lobby all vital seats in county government, the state and congressional offices to make headway among policymakers.
- Usually, education institutions and/or workforce boards have the most clout with government officials and get the lion's share of resources. Manufacturers generally do a poor job of communicating their needs. The result is that government allocations are often distributed among workforce boards and education for programs that lack the required backing and support of manufacturing employers.
- Policymakers listen when manufacturing employers complain about the technical workforce skills gap. But because manufacturing needs are not predictable and manufacturers do not offer real-time solutions, policymakers resort to more conventional investments in education. This, in turn, causes the gap in communication between industry and education and policy makers to proliferate.

EDUCATIONAL INSTITUTIONS

Education institutions in the U.S. often seek feedback and advice from employers on what skills sets are required in today's industry. Yet, small- to medium-sized companies cannot always articulate their exact skill set needs and have little or no time to manage an in depth training program. An individual company generally requires fewer than the minimum of 10-12 trainees required by the community college to justify offering the class. And to make matters worse, very few trainers in the U.S. qualify to teach the rigorous and robust German dual education system curriculum.

The best candidates to teach the German dual education system are those that have been through the program themselves, such as a German national who now resides in the U.S. However, these German nationals have never attended the university system in the U.S. and do not hold the credentials required for an instructor within the

public school system. While the best American machinists and machine operators may have the expertise required to teach U.S. industry certifications, they are usually not prepared to teach the German system, one that goes far beyond the formal training typically provided in the U.S. and that requires the student to learn in greater depth than required for comparable U.S. programs.

For example, the formal training of a machinist in Germany is typically 3½ years, starting at directly after their school exam (everybody even without any school award does have access to the apprenticeship system in Germany, which is stipulated by the Vocational Training Act) as an apprentice, gaining reflective competence at a company and going to school to learn the academic knowledge required to advance in his occupation. Upon conclusion of the apprenticeship, the machinist trainee is required to machine all the component parts of a combustible engine by hand, assemble the engine and knows how and why he or she is acting. To pass the final exam, the apprentice must prove that he or she can operate engines that meet all specified requirements. This level of intensive training does not take place within the U.S. education system. Following the German dual education model, the responsibility for teaching the in-depth training should begin midway in high school and continue on into the first two years of post-secondary at community colleges, vo-tech, or university systems. Given the limitations of the U.S. system in dealing with certifications reaching the German standard, many German companies train students at their own facility or at an offsite training center near their company.

Many U.S. states' educational school systems are beginning to embrace the need to focus on STEM (Science, Technology, Engineering and Math) education. Several are developing career pathways for students in high school that focus on specific industries. These schools are typically organized as "career academies" that reside within the public high schools. Despite the popularity of career academies with students and their moderate success, not many of these schools attract sufficient industry involvement. Employers provide too few internships to help students make sound career choices and too few apprenticeships to allow these students to gain the training and experience they need to gain expertise in a relevant profession. Still, some leading engineering and/or aerospace high school career academies are being led by retired engineers and are providing both academic and practical experience.

Insurance liability issues and regulatory provisions further complicate the use of concepts from the German model. Often, regulations prohibit students younger than 18 from working on the floor of a manufacturing facility. Manufacturers are sometimes able to find innovative ways to avoid the liability risks to train the high school workforce, but it complicated to do so.

As pathways through career academies are becoming more successful and more students are being placed into internships and apprenticeships, the current issue and question some communities are already facing is, how will vocational high schools, community colleges and universities prepare to provide the relevant curriculum needed to complement the advanced practical experience gained from the workplace?

Education stakeholders often face a range of obstacles:

- Most educational institutions are not willing to risk the sizable investments in new equipment, training materials and staffing of instructors to begin a specialized training program unless they have a guaranteed pool of companies interested in hiring the pool of students coming out of these programs.
- Though manufacturers continue to express the need for skilled technicians, product design engineers and machine operators, it is difficult for one company to provide the 10-12 minimum number of students required from one semester to the next on a long term basis without a consortium of companies expressing the need and ability to employ these same skills sets.
- Many schools have made investments only to shut the training down not because of a lack of student interest, but the lack of manufacturer's participation in the placement of these students into the workplace.
- Many educators claim that internships and apprenticeships have always been the fabric of U.S. training, but because they do not understand the complexity and depth of the German system, they are not able to credibly compare one to the other.

PARENTS, STUDENTS, TEACHERS AND THE GENERAL PUBLIC

Parents, students, teachers and the general public generally are unaware of the structure and the benefits of the German Dual Education system. The common perception of the public is that a college degree is the only route to a good job and to earning a decent standard of living. In the context of weak U.S. career-focused education and training systems, the public perception is understandable. The result is a kind of chicken-and-egg problem. Until a solid career-focused system that builds on the German model is in place, parents and students will still see college as the single route to career success. Until parents and students recognize the value of career-focused education and training, it will prove difficult to implement systems that draw on the German model. To overcome this quandary, the process must move incrementally. Good programs built on the German model will attract excellent U.S. students; their positive experiences will encourage additional programs and begin to convince parents about the value of the dual school-based, work-based approach to learning and career development.

Another obstacle in the mindsets of Americans with some knowledge of the German system is the early tracking of students. They do not have to choose at a very young age between a vocational or a university track as in Germany. Moreover, while they decide by early high school, the vocational track students receive a high-quality education, especially in the sciences. The common drawbacks and obstacles encountered in the parents/students/teacher/general public stakeholder group are:

- The general public is generally unaware of the "German Dual Education System," its effectiveness in training students to high levels of competence and its ability to greatly improve the school to work transitions. The public lacks knowledge about how combining academic theory, serious work-based learning,

and contributions to production can lead to rewarding careers at little student or parent cost.

- Those who have heard of the German system often believe students are channeled into working class jobs with a dismal future and no opportunity to change careers.
- Parents, students and teachers still view manufacturing as a dirty industry, with low paying jobs, menial and boring jobs, an unsafe working environment, and few advancement opportunities.
- Few members of the public have toured an advanced manufacturing facility where parts are designed in 3-D CAD and the equipment is largely automated with robots.

OVERCOMING NEGATIVE PERCEPTIONS OF MANUFACTURING, OCCUPATIONAL LEARNING

A number of stories in the U.S. media have highlighted positive aspects of German dual system after President Obama mentioned the German education system in his 2012 and 2013 State of the Union messages. Yet, the stories have failed to convince many skeptics. They argue that the German dual education system is far too complex to implement in the U.S. without a major overhaul to fundamental beliefs and the existing educational infrastructure embedded in the U.S. education system. Moreover, though acknowledging some weaknesses, they can point to the U.S. success in educating a diverse array of students and in maintaining the top-rated university system. Many U.S. universities are among the best in the world. Students from many other countries come to the U.S. to study in these higher education institutions. Earning a degree from any prestigious school usually offers a ticket to future prosperity anywhere in the world.

The success and scale of U.S. colleges and universities have tempted policymakers to adopt a virtual college-for-all (CFA) approach to education. The approach has penetrated the high schools through a common core curriculum that mainly focuses on preparation for a four year college degree. In part, the CFA policy comes from viewing skill almost entirely in academic terms, ignoring a wide range of important occupational and employability skills. The results of the CFA policy have been poor. One in five students fail to complete high school. About three in five never complete a two-year or four-year college degree. Further, U.S. students fare poorly on tests of math, verbal, and problem solving abilities.

Career counseling is quite limited in the U.S. High school students rarely have a good idea of the array of occupational possibilities open to them. The focus of most school counselors is on college. In fact, first on the list of College and Career Readiness presented by the College Board National Office for School Counselor Advocacy was to, “Build a college-going culture based on early college awareness by nurturing in students the confidence to aspire to college and the resilience to overcome challenges along the way maintain high expectations by providing adequate supports, building social capital and conveying the conviction that all students can succeed in college.” This is clearly in line with the “College for All” mentality.

The focus on college over careers is natural, given the backgrounds and training of high school counselors. Most have BA or higher degrees in education or counseling. Most have been teachers prior to becoming high school counselors. Moreover, even if some counselors are effective in providing career counseling, there is only one counselor for every 400 public school students. An effective cadre of counselors with experience and knowledge of the broad labor market is unlikely to emerge based on education budgets and the strong emphasis on college.

Given the weakness of career counseling, the current and potential roles of youth apprenticeship programs and Career Academies take on a high level of importance. Prior to entering such programs, students receive some counseling about potential careers by their sophomore years, at least those related to the occupations available. Thus, implementing initiatives that embody aspects of the dual system is critical not only for providing access to rewarding careers but also for helping young people learn about a range of careers.

U.S. policymakers should recognize that many students who fare poorly in the U.S. academic system might succeed under a system that emphasizes a company-based career focus, learning-by-doing, and incorporating the work culture into their lives. In general, the U.S. education and training system is failing to develop enough quality, non-college routes to good careers. It fails to offer sufficient options to those who learn best and work best in a company context with real production and earning a wage. At the end of the day many students gain great satisfaction from seeing something that they build or had a part in building and when they have a full understanding of how and why things are functioning.

The skeptics are right in recognizing that the German dual education system cannot simply replace the American system. However, they often ignore the potential for drawing heavily on the lessons from the dual system for building career pathways, real world experience and skill certification. Already, several positive and popular education movements are ongoing across the country. They include expanded hands-on STEM education through Project Lead the Way. In a few places, schools systems attract industry involvement to offer internships or apprenticeships.

In order to overcome negative perceptions about a combined dual school-based and work-based system similar to the German system, the industries and occupations linked to the program should cover a wide range and should include engineering and other fields requiring extensive STEM education. German companies can be especially helpful in jumpstarting a broader approach to U.S. education that involves work-based learning and builds occupational credentials. They can attract peer companies, advise school systems on curricula and operations, be in the forefront of offering internships and apprenticeships, and highlight the importance of occupational skills in addition to generic academic skills. Already, German companies are playing this role in several local and state initiatives. However, bringing the approach to scale in ways that can benefit large numbers of students, companies, and the general public will require that we learn from existing initiatives in the field.

SUCCESSFUL IMPLEMENTATIONS OF GERMAN DUAL EDUCATION IN THE U.S.

Though internships and apprenticeships are not new in America, implementing the German dual system would represent a major departure from existing practice. Still, it is gaining popularity within the communities where it has been implemented. Certain pockets of the country have begun implementing elements of the system, largely as a result of a German company or group of German companies that have led efforts to reform occupational training in their communities. Among the most notable examples currently in progress within the United States are the following:

GREATER CHARLOTTE AREA (LOWER NORTH CAROLINA AND UPPER STATE SOUTH CAROLINA)

APPRENTICESHIP 2000 (Ameritech, Blum, Chiron, Daetwyler, Pfaff Molds, Sarstedt, Siemens, Timken)

In 1995, Blum, Inc., a subsidiary of Julius Blum GmbH from Austria, started the first apprenticeship program in the Charlotte area, modeling the European Dual Education System also used in Austria, Germany and Switzerland. After many attempts to train workers with "so-called" manufacturing experience available on the market, the company found these workers lacked the technical experience and innovation required for their workforce. This led Blum to the apprenticeship approach. Because Blum hired too few apprentices to fill a class at the local community college, Blum decided to train the workers themselves.

Blum interviewed some students from the local high schools interested in the apprenticeship program and selected company apprentices. Blum learned through this experience, that given the opportunity, American students were just as capable of learning the technical skills as the apprentices at their parent company in Austria. From Blum's success in this first year trial, Blum began discussions with other advanced manufacturing companies in the area who shared the same dilemma of not being able to find sufficient skilled technicians and not having enough students to support a full class at the community college.

From these discussions Apprenticeship 2000 was founded and launched by Blum and Daetwyler in 1996, with Timken, Ameritech and Sarstedt gradually joining forces in the consortium to grow to five companies who now together could consistently meet the minimum class size requirements of the community college, which was eight students at the time. Together, they approached Central Piedmont Community College (CPCC) with their training requirements and CPCC started providing the specialized class room training. The program was called Apprenticeship 2000 (APP2000), because, being a four-year apprenticeship program, the graduation class would take place in the year 2000. Today, APP2000 offers specialized apprenticeship training for the following skilled professions:

- Tool and Die Maker
- Electronics Technician
- CNC Machinist
- Machine Technician
- Mold/Plastics Technician

- Welding Fabricator
- Quality Technician

The benefits of the program for students are:

- AAS degree in Mechatronics Engineering Technology
- Apprenticeship certification from NC Department of Labor (NC DOL)
- Earn a minimum of $34,000/year at completion
- Benefits (medical/mental, paid holidays)
- Guaranteed job after graduation
- Possible travel opportunities
- 8,000-hour program
- Tuition is paid 100% by companies
- Get paid to go to school!

Beginning each December, APP2000 holds an open house at all participating companies for parents and students in their junior or senior year. From this open house, students can sign up for a four-day orientation that will be held together with two companies for 3½ hours each day after school. After orientation the companies select their candidates for a six-week summer paid internship program to take place between their junior and senior year. After completing the summer internship, the companies offer on-the-job training (OJT) during their senior year, if selected as apprentices. Once selected, the student leaves the high school at noon to work for the company in the afternoon.

Over the years the APP2000 consortium has grown to eight companies with the addition of Pfaff Molds, Siemens, and most recently, Chiron. Currently, this consortium has decided not to add additional companies due to control and management relating to this size of consortium and all of the collective needs being met. However, APP2000 supports multiple programs to be established based on the APP2000 model in different counties in the Carolinas. Examples: Greiner Bio-One in Monroe, NC together with SPCC (South Piedmont Community College) and the 7-company partnership NCTAP (North Carolina Triangle Apprenticeship Program) together with Wake Tech Community college.

Blum reports an incredible retention of 80 percent of over 50 trainees that have come through their apprenticeship program since its inception. Today, many of these trainees have advanced into management and engineering roles within the company.

Blum's apprenticeship program is probably one of the best examples in the United States of successfully implementing a German-based apprenticeship program. The four-year apprenticeship program starts at 17 years old with seniors in high school. Blum and the apprenticeship partners in the consortium replicate the hands-on practical training practices at the work place, as found in Germany and other European countries. Since the program's inception, Blum has dedicated more than 10,000 square feet of training space for a training center within their company's facility. Blum also put in place full-time paid instructors and the company has invested millions of dollars into specialized equipment in the training center.

One of the most recent companies to join the APP2000 consortium is Siemens, a company which operates a power generator facility in Charlotte and

which has to train and fill up to 70 apprenticeship positions. With this inclusion into the consortium, CPCC has recently announced its cooperative agreement with the German IHK in Karlsruhe to begin offering German IHK-certified training at CPCC. Clearly this progress within CPCC could not have been made without the foresight, vision and success of the APP2000 consortium.

Since 1996, the German advanced manufacturing business community in the Greater Charlotte area has grown to over 200 German-owned manufacturing subsidiaries. This is a classic economic development example in which industry-driven training needs are met by the community and the community prospers from the initiative. The APP2000 example provides measurable and tangible proof that the Dual System of Education can affect positive change to a community. It is also evidence that if the community listens to and helps with industry skill needs by providing the training required for advanced manufacturing, then other companies with the same high-tech advanced training needs will follow suit and locate there. This all would not have been possible, had Blum and other local industries not banded together as the APP2000 consortium to challenge the local education system and drive the training needs required by their companies.

The decision by the APP2000 consortium not to take on more partners has presented challenges to other small to medium companies in the Charlotte area who want to establish apprenticeships along the lines of the model. Students from other firms can enroll into the CPCC classes intended for APP2000 students, as long as there is room, but usually the challenges are far deeper than available spaces in existing classes. For example, if other firms have needs that do not correspond to classes offered for the APP2000 students, they face the issues that the APP2000 companies initially experienced of not having enough students to support the class at the community college level.

To learn more about APP2000, visit www.apprenticeship2000.com.

Fortunately, with a benchmark program within the area and state, APP2000 has established a strong foundation in the Charlotte area for others to model. In fact, the success of APP2000 has spawned many new apprenticeship efforts in the area modeling their initiative and drawing all counties and communities in the Charlotte area even more tightly together. Here are a few examples:

STEAG AND CEO ROUNDTABLE OF CAROLINAS' ADVANCED MANUFACTURING COMPANIES

In Kings Mountain, NC, Hans Hartenstein, President of the German-owned company, STEAG Energy Services, LLC, wanted to start an apprenticeship program for his company. He first looked to the APP2000 consortium, but quickly learned that the consortium was neither taking on new partners, nor did his company need Mechatronics graduates. His local community college had not yet developed a program to accommodate his apprentices. He then began discussions among other companies in the area that also wanted to grow apprenticeship programs and found a great many companies willing to participate who were outside the APP2000 consortium. With this encouragement, he started the CEO Roundtable of Carolina's Advanced

Manufacturing Companies (of which APP2000 companies participate) to explore opportunities within the area to increase the apprenticeship programs outside of the APP2000 model. The CEO Roundtable meets once every six months or so, where advanced manufacturing companies discuss, among many other things, the latest efforts in the area to close the more than obvious skills gap by, among various other initiatives, implement the dual system apprenticeship programs in the area, so that all companies are informed and can collaborate as one voice on improving the workforce opportunities in the area. This forum has launched a great collaboration in the Greater Charlotte area which includes companies and educational institutions from North and South Carolina.

STEAG recently announced the start of their new apprenticeship program called the STEAG Apprenticeship College Training (ACT) program, which was recently registered with the North Carolina Department of Labor. Every year, STEAG hires three apprentices for a three-year program to become "Chemical Operators" and two apprentices for a two-year program to become "Industrial Mechanics." Training is being done in collaboration with Gaston College. At the end of the program, the apprentices will receive a "Completion of Registered Apprenticeship" certificate and an Associate Degree from Gaston College.

APPRENTICESHIP CATAWBA

On September 13, 2013, The Hickory Record reported news about the start-up of Apprenticeship Catawba, which is a community collaboration starting with a consortium of five companies (Technibilt, Sarstedt USA, Tenowo Nonwovens, GKN Sinter Metals and ZF Chassis Components), the Catawba Valley Community College, the North Carolina Department of Labor, as well as high schools in Alexander, Catawba and Lincoln counties to offer four-year apprenticeships.

The Apprenticeship Catawba model is very similar to the precedent set by APP2000:

- Orientation site visits to the companies during the junior year
- Interviewing and screening of companies and students
- Selection of candidates for a week-long orientation in the spring
- A six-week paid internship during the summer
- Selection of the top candidates to begin the apprenticeship
- First year of apprenticeship starts in the senior year where the student works on-the-job training (OJT) training hours: half day at school in the morning and at the company in the afternoon
- Apprentices go to work full-time after high school graduation
- In the second year, students begin to attend the community college one day a week and work at the company four days a week
- Company pays for college tuition and books
- After the four-year program is over, the apprentice graduates with an Associate Degree in Mechatronics Engineering Technology or Computer Integrated Machining technology
- Apprentices also receive a Journeyman's Certificate through the NC DOL signifying completion of 8,000 hours of OJT training

- Apprentices who complete the program successfully have a guaranteed job waiting for them starting at $34,000 or more

This is an example how one successful pilot in a region can spark interest and support within the community and how the momentum and enthusiasm can build within that region.

EDUCATION STAKEHOLDERS INVOLVED IN THE GREATER CHARLOTTE AREA

The regional high schools involved in the German dual education apprenticeship model are:

- Alexander County schools
- Cabarrus County schools
- Catawba County schools
- Charlotte-Mecklenburg schools
- Gaston County schools
- Iredell-Statesville schools
- Lincoln County schools
- Mooresville Graded School District

The community colleges involved in the German apprenticeship model are:

- Catawba Valley Community College
- Central Piedmont Community College
- Gaston College

Altogether, the result of all these efforts collectively for the Greater Charlotte area is a strong and growing well-trained workforce pool of young students that are ready for work with highly technical skills. This strong labor pool is an attractive draw for existing industrial employers, as well as new prospective companies interested in locating to the area.

The acceptance and enthusiasm of apprenticeship programs in the Greater Charlotte area did not happen overnight, but now all four major stakeholder groups mentioned at the beginning of this paper are committed and engaged, and the most important of all these—and the most difficult to reach—is the acceptance and understanding of the parent and student stakeholder group. Now the community and general public has seen living proof how the change has brought forth positive growth in the community. As a result more students and parents are accepting this path as a viable alternative to the traditional choice to go a four year university, incur a debt you cannot repay in a lifetime and hope you find a decent paying job with no practical work experience when you graduate.

INDEPENDENT EFFORTS IN SOUTH CAROLINA, KENTUCKY, MICHIGAN AND FLORIDA

BMW

When BMW decided to set up manufacturing in 1992 in Greer, SC, on the outskirts of Greenville and Spartanburg, the impact it would have on the surrounding community and what the ripple effect would have for the area was unimaginable. The excerpt below from the Greenville Area Development Corporation says it succinctly:

Since 1994, BMW and Upstate automotive suppliers have invested over $3 billion and created more than 7,000 jobs in the region. The relationship between the automotive industry and the Upstate continues to grow and evolve almost daily. As a

cornerstone for this cluster, BMW, the state of South Carolina, and Clemson University formed a partnership to establish a premiere automotive/motorsport research center in Greenville. The Clemson University International Center for Automotive Research (CU-ICAR) is located on a 250-acre campus along I-85 in our region. CU-ICAR is home to the Clemson University Graduate Engineering Center that offers our region advanced degrees in automotive engineering and motorsport technology.

With the decision to locate in Upstate South Carolina in 1992, BMW Manufacturing Company created momentum for overall growth in the Southeastern automotive industry. Since then, the Spartanburg Plant has produced a total of 1.6 million units and has contributed an estimated $4.6 billion to South Carolina's economy. Currently, BMW is responsible for 23,000 jobs in South Carolina and generates $1.2 billion in annual wages and salaries.

- This plant exports 70 percent of their throughput to BMW's other world markets, making the facility truly a substantial "world plant"
- 1,600 new jobs are being created at the Spartanburg plant as a result of a fifty percent increase in production capacity set for 2011
- With BMW's decision to locate in the Southeast, forty of its suppliers are now located within a few hours of the Spartanburg County plant
- The ripple effect from these moves has resulted in the creation of more than 10,000 jobs for the state

This project is a classic example of economic development at its best. While a community must have appropriate sites and receptivity to business, the number one requirement a company like BMW will seek is the communities' ability to train its technical workforce. BMW succeeds partly because of its interactions with the German Dual Education System. At the same time, BMW's location to South Carolina is a success due to its location near Clemson University and the workforce training programs Clemson is able to implement for specifically for BMW.

The technology seen at BMW is not exclusive to large companies in Germany. Small- to medium-sized companies have access to similar technologies and a technically-trained workforce as does BMW, because technical training is standardized throughout Germany. Whether a student is a Mechatronics or Industrial Engineering apprentice at BMW or at a smaller company, the credentials are virtually the same. The student apprentice is equally qualified to work at mega companies like BMW, Mercedes, VW, Audi or any other highly advanced German manufacturing company in the world, no matter how large or small.

Small- to medium-sized German companies trying to change the education dynamics of their community are disappointed when their preaching falls on deaf ears and when they witness the far more favorable treatment that large companies like BMW get from community stakeholders. When a company like BMW can enter any community and demand changes it needs to develop a highly-trained workforce, the community will leap over backwards to accommodate its needs. Unfortunately, small- to medium-sized German companies using the same technologies and employing the same qualified skilled technicians as

BMW often see little or no progress even after they work publicly to embrace aspects of the German dual education system.

Communities need to remember that small businesses make up more than 80 percent of all businesses in the United States and a large share of employment. Could we perhaps learn and gain something from helping the German companies obtain their workforce needs in the community, and could it possible improve our ability to attract higher technology companies and higher paying jobs?

Stober Drives, Inc.

The Stober Drives Inc. (SDI) apprenticeship program was established in 2005 with three apprentices, one in each of the following fields: machining, electrical, and maintenance.

Apprenticeship program statistics: Currently there are eight apprentices in seven disciplines. Since 2005, a total of 22 apprentices have been enrolled in the SDI program in nine disciplines: Accounting (2), Customer Service (5), Electrical (1), Metrology (1), IT (2), Machining (3), Maintenance (2), ME/IE (4), Marketing (2). Out of the 22 apprentices, all but three have left the program.

Results: SDI apprentices are very productive, during the apprenticeship and thereafter. The return on investment typically begins shortly after the apprentice enters the program. All graduates have been placed into permanent employment at Stober, in the discipline they chose as apprentices. Seven of eleven graduates are in significant leadership roles, and the company is confident they will continue to move higher in the organization. Nine of eleven graduates completed an Associate degree or higher, either during or after the apprenticeship. The other two are still pursuing their degree. Apprenticeship graduates are out-performing their peers who did not go through the program. SDI believe employee development is the most important aspect of their business, and that their apprenticeship program is a major determining factor in their current and future success.

Apprenticeship structure: A curriculum is developed for each discipline in cooperation with local learning institutions. SDI has had great support in developing these curriculums, especially from Maysville Community and Technical College (MCTC), even for a single student in a particular discipline. SDI has used the General Occupational Technical Studies degree as the vehicle to create customized programs for disciplines such as customer service/inside sales and marketing. Apprentices spend ten hours per week in class at a local college or university. They work at SDI 30 hours a week. They are paid 40 hours per week and offered full benefits. The wage is determined as a percentage of the wage of the final position, increasing incrementally throughout the program; generally starting at 75 percent of entry wage and increasing 10 percent per year for four years, putting them at 105 percent of entry level upon graduation. Tuition and books are fully paid by SDI, with the requirement of a "C" or better in each class. If the apprentice does not earn at least a "C", they take the class over on their own time and at their own expense. SDI assigns each apprentice to a "mentor/journeyman" who is responsible for the OJT portion of the program. Upon graduation, the Kentucky (KY) Department of Labor (DOL) issues a journeyman's certificate to the apprentice, but only for the jobs currently recognized

by the state of Kentucky. More disciplines should be included, and surely will over time.

Process to establish the apprenticeship program: SDI benchmarked companies to learn about apprenticeship programs. The KY DOL assisted with the application process, which turned out to be very easy. MCTC was very helpful in guiding SDI through the process of curriculum development; in most cases SDI uses their curriculum as it is in the course catalog. Funding has been received from the state of Kentucky in the form of grants and tax credits.

Original goals: The intent was to hire young people right out of high school, 18 years old, primarily in the machining and maintenance disciplines, ideally with experience through the high school area technology center (formerly known as vocational center). Traditional apprenticeships have center around skilled trades: machining, pipe fitting, construction, etc., but at SDI, they now think almost any position in any discipline can be apprenticed.

Findings, lessons learned: SDI was not able to find enough suitable apprentice candidates right out of high school to meet their demand. Lack of maturity, motivation and direction has been the greatest limiting factor with high school graduates. The age range of apprentices actually entering their program has been 18-43, with an average age of 29. Many enter the program with extensive work experience, to further their education or move into a different field of work. Significant maturity is required, as apprentices must be willing to attend at least two classes per semester, while managing their workload at SDI also.

Further Program Development: Further development of SDI's apprenticeship program should be centered on standardization of curriculum, competence and testing. Ideally, SDI program graduates would be certified and recognized not just in the state of Kentucky, but nationally and internationally. Moving forward, SDI would be open to adjusting their curriculum and testing to meet national and international standards. SDI efforts to encourage other companies in the community to start apprenticeship programs have failed so far. More companies with programs would create more demand for local educational resources. Moreover, the process of educating students, parents, teachers and counselors about the value of skilled trades in general, and apprenticeship programs in particular, has proven to be difficult.

Michigan Advanced Technician Training (MAT2)

Industry and government leaders started a recent program in Michigan using the German apprenticeship model called the Michigan Advanced Technician Training (MAT2) program. Below are some excerpts from the fact sheet regarding the program:

The Michigan Advanced Technician Training (MAT2) program is an innovative and industry-defined approach to postsecondary education. An educational model developed in conjunction with global technology leaders, MAT2 combines theory, practice and work to train a globally competitive workforce by:

1. Allowing companies to "grow their own" employees and ensure a pipeline of qualified talent
2. Directly involving the employer in the development and execution of a hands-on,

competency based education and training program, creating highly skilled, capable and readily employable graduates

3. Offering an economically feasible option to training, ultimately reducing recruitment, retention, training, and turnover costs
4. Establishing Michigan as an education innovator and global competitor
5. Creating a nationally accredited program, in which students receive an associate degree, along with other accreditations where applicable and depending on the program

For more information about MAT2, visit www.mitalent.org/mat2.

AMskills (American Manufacturing Skills Initiative) in the Tampa Bay Area

In 2014, industry, government and education leaders from the Tampa Bay region in Florida went to the Florida State Legislature to seek support to start The Tampa Bay Advanced Manufacturing Skills Initiative that was based on the German apprenticeship model inspired by the successes of APP2000 in Charlotte, NC.

Today, this Initiative is a $2.35 million, three-year initiative funded by the state of Florida and three counties in the Tampa Bay area (Pasco, Pinellas and Hernando counties). Five Industry Certification Training Centers (ICTC) are to be co-located at educational and industrial facilities. Named initially the Tampa Bay Advanced Manufacturing Initiative, this initiative will begin to implement an apprenticeship training program based upon the German Dual Education model in the Tampa Bay area. The name of this initiative has been rebranded as AMskills (American Manufacturing Skills Initiative) which is strongly based upon the German apprenticeship programs specializing in advanced manufacturing. Of the 350 occupational standards mentioned earlier in this paper, AMskills has identified 48 of these German IHK occupational standards which all offer 3½ year apprenticeships that are geared towards advanced manufacturing occupations.

Eleven local manufacturing companies have joined AMskills in a manufacturing consortium with plans to expand this consortium to 50 or more local companies. Students are being recruited with the assistance of the local school districts, community colleges and universities.

Another very critical part of the AMskills program is the strong establishment of collaborative equipment vendor partners such as Hoffmann Group, EMCO Maier, FESTO, Weiler and HAAS. What all of these companies have in common are their commitments to apprenticeship training in advanced manufacturing. These international equipment vendors are critical components to the success of a German Dual Education Model to be successful in the U.S. With these companies comes not only the years of perfecting the training equipment and manuals that help to assure the program is implemented like it is in Germany and Europe, but also the international recognition and credibility that these companies bring to an apprenticeship program. These companies are recognized in Germany, Europe and internationally as the world leaders in innovative apprenticeship training using the German Dual Education model.

To learn more about the AMskills initiative, visit www.amskills.org.

STATE YOUTH APPRENTICESHIP PROGRAMS

Individual success stories demonstrate the feasibility of using concepts from the German dual system on a company basis. But, reaching scale in the U.S. requires system-wide initiatives. In the late 1980s and early 1990s, several organizations and policymakers called for the creation of a national youth apprenticeship program. Although this initiative did not prevail, some states have developed state-wide programs.

Georgia Youth Apprenticeship

In 1992, the Georgia General Assembly passed a law directing the Departments of Education, Labor, and Technical Adult Education to develop and implement youth apprenticeship programs by 1996. Today, the program operates successfully with over 7,000 participants.

During their freshman and sophomore years of high school, students learn about the possibility of joining the apprenticeship program in their junior and senior years. Students can then apply to participate in a structured program of at least 2,000 hours of work-based training and 144 hours of related courses. Apprentices not only complete their high school diploma but also a post-secondary certificate or degree, and certification of industry-recognized competencies applicable to employment in a high-skilled occupation. The fields vary widely from energy to information technology, manufacturing, and transportation and logistics. Mentorship is a key part of the program, as are employer evaluations of the student's job performance, and the building of professional portfolios. As of 2009, over 7,000 Georgia students were participating in a youth apprenticeship.

High schools are responsible for recruiting counselors, supporting career-focused learning, and assisting in identifying industry partners. Post-secondary schools participate in developing curriculum and dual credit arrangements. Businesses offer apprenticeship positions, provide each apprentice with a worksite supervisor, and insure that apprentices gain experience and expertise in all the designated skill areas. The worksite supervisors must participate in mentor orientation and training, so that they can guide students through all the skill areas and serve as a coach and role model. Parents must agree to and sign an educational training agreement and provide transportation to the student. Finally, young people must maintain high levels of attendance and satisfactory progress in classes (both academic and career-oriented) and the development of occupational skills at the worksite.

Employers report high levels of satisfaction with the apprentices and the apprenticeship program. Over 95 percent say the program has been highly beneficial to the company and that they would recommend the program to other companies. Participating companies also report good-quality student performance in problem-solving and communication skills. There has been no rigorous evaluation of the impact of apprenticeship participation on students in Georgia, but participation has been growing both among companies and students.

Wisconsin Youth Apprenticeship

Wisconsin Youth Apprenticeship was created in 1991 through Wisconsin Act 39 as a school-to-work initiative to prepare students for the workforce and create options for students not planning to attend college.

The state's Youth Apprenticeship Program (YAP) is based on the German apprenticeship model. It developed after local business, education, government and industry leaders traveled to Germany to learn about the system. The program partners schools with a variety of industries using the combination of work-based learning, paid employment and related schooling.

Beginning in their junior year of high school, Wisconsin youth apprentices are paid for 10-15 hours per week of work and take four semesters of apprenticeship-related classes while completing their academic course requirements. One of its first apprenticeship programs began in the printing industry in 1992. This program alone has produced 125 graduates. During the program, these apprentices maintain very low absenteeism rates. After completing the program, 94 percent took jobs in the printing industry, far more than the 13 percent who took printing classes without an apprenticeship. Three of four apprentices were working for their apprenticeship employer in the eight months after graduation. Despite having below-average grades before entering the apprenticeship, apprentices earned substantially higher wages after the program. In addition, they were more likely than their peers to plan to complete a higher education program.

Currently, nearly 2,000 apprentices take part in YAPs throughout the state. Wisconsin Governor Scott Walker recently increased the budget for youth apprenticeship to about $2.6 million to be distributed to 31 regional apprenticeship associations.

The Department of Workforce Development is the state agency for administering YAP, developing and maintaining the occupational standards, and awarding grants to individual school districts. The Youth Apprenticeship Coordinator in each area acts as the central contact for schools, employers and students. The coordinator develops programs with employers, recruits students, monitors program operations and evaluates apprenticeship activities. School district staff play a role in student recruitment, as well as monitoring the academic progress of participating students.

The programs require work-based learning ranging from a minimum of 450 hours for a one-year program to 900 hours for a two-year program. The minimum technical instruction from related courses amount to 188 hours for a one-year to 360 hours for a two-year program. Each program has a set of learning objectives with a Skills Standards Checklist of skills considered essential for each occupation. Students work at firms earning apprenticeship wages under the supervision of an assigned mentor. A survey of students indicated they viewed the workplace mentor as an important part of the apprenticeship experience.

The apprenticeships are offered in specific occupations within one of ten occupational clusters. These include: agriculture, food and natural resources; architecture and construction; arts, audio-visual technology and communications; finance; health science; hospitality, lodging and tourism; information technology; manufacturing;

science, technology, engineering and math; and transportation, distribution, and logistics. Employer surveys generally find high levels of satisfaction with the YAP.

TOWARD A HIGH-QUALITY MODEL FOR A DUAL EDUCATION SYSTEM IN THE U.S.

Interest in apprenticeship programs starting in high school has ebbed and flowed in the U.S. The dual approach attracted serious policy proposals in the late 1980s and early 1990s. President George H.W. Bush proposed the National Youth Apprenticeship Act of 1992. It would have established, "...a national framework for implementing comprehensive youth apprenticeship programs...for preparing young people to be valuable and productive members of the 21st century work force." The plan clearly would have resembled the dual system.

As President Bush explained, "...a student could enter a youth apprenticeship program in the 11th or 12th grade. Before reaching these grades, students would receive career and academic guidance to prepare them for entry into youth apprenticeship programs. Particular programs may end with graduation from high school or continue for up to an additional two years of postsecondary education. In addition to the high school diploma, all youth apprentices would earn a certificate of competency and qualify for a postsecondary program, a registered apprenticeship program, or employment. A youth apprentice would receive academic instruction, job training, and work experience. The program is intended to attract and develop high-quality, motivated students. Standards of academic achievement, consistent with voluntary, national standards, will apply to all academic instruction, including the required instruction in the core subjects of English, mathematics, science, history, and geography. Students also would be expected to demonstrate mastery of job skills."

The Bush Administration proposal turned out to be the high water mark for federal policy toward the dual system. Subsequently, Congress enacted a Clinton Administration proposal, the School-to-Work Opportunities Act of 1994 (STWOA), that emphasized careers, but downplayed youth apprenticeship. Funding and authorization for STWOA expired by the end of the 1990s and was never renewed.

Past experience raises questions about whether apprenticeship can become a serious jobs and training strategy for American youth. One complication is that the current U.S. registered apprenticeship system is almost entirely divorced from high schools and serves few workers under age 25. Only a few states now operate YAPs that provide modest numbers of opportunities to 16- to 19-year-olds. State government spending on youth apprenticeship programs amounts to only about $3 million in Georgia and $2 million in Wisconsin. With sufficient funding, these models could be replicated and expanded to reach hundreds of thousands and perhaps millions of American youth. To create about 250,000 quality jobs and learning opportunities, the gross costs of such an initiative would be only about $105 million (about $450 per student-year or about 4 percent of current school outlays per student-year). Some of these costs would be offset by reductions in teaching expenses, as participating students spend more time in work-based learning and less time in high school courses.

A good place to start is with Career Academies, schools within high schools that have an industry or occupational focus. Over 7,000 operate in the U.S. in fields ranging from health and finance to travel and construction. These programs already include classroom-related instruction and sometimes work with employers to develop internships in fields ranging from health and finance to travel and construction. Because a serious apprenticeship involves learning skills at the workplace at the employer's expense, the academies would be able to reduce the costs of teachers relative to a full-time student. If, for example, a student spent two days per week in a paid apprenticeship, the school should be able to save at least 15 percent of the costs. Applying these funds to marketing, counseling, and oversight for youth apprenticeship should allow the academy or other school to stimulate employers to provide apprenticeship slots. Success in reaching employers will require talented, business friendly staff well-trained in business issues and apprenticeship.

To implement this component, state governments should fund marketing and technical support to Career Academies to set up cooperative apprenticeships with employers and, in selected fields, with unions. The first step should be planning grants for interested and capable Career Academies to determine who can best market to and provide technical assistance to the Academies. Next, state governments should sponsor performance-based funding to units in Academies so that they receive funds for each additional apprenticeship. Private foundations should offer resources for demonstration and experimentation in creating apprenticeships within high school programs, especially Career Academies.

CHALLENGES THAT EACH COMMUNITY FACES IN OVERCOMING OBSTACLES

The case studies illustrate how organizations have been able to overcome the challenges in adopting aspects of the German dual system. We now turn to general challenges that community programs face.

The first issue is the relationship between youth apprenticeship and Federal-State Registered Apprenticeship system. Germany's dual system attracts young people while they are still in upper secondary school and about 16-19 years old. In contrast, the median age in the U.S.-registered apprenticeship system is about 26. Some U.S. model programs work with students immediately after high school, but few registered apprenticeships work with high schools.

Building apprenticeships at the high school level has advantages, yet faces barriers. One advantage is that states offer free academic and vocational classes at the high school level, thus potentially reducing the costs to employers of financing related instruction. A second advantage is that the wage rate for high school apprentices can be low relative to apprentices who are already in their mid-20s. A third advantage is that high school apprentices can learn tasks and work habits without having to break old habits.

One barrier is the heavy high school course requirements that limit the amount of time student apprentices can spend at the workplace. A second barrier is coordinating the timing and class size sufficiently. High schools may decide it is uneconomic to offer a specific course related to an apprenticeship when only a few students will participate. A third barrier is that a key

performance measure by which high schools are judged is the share going on to college. As a result, the incentives to engage with employers and provide youth apprenticeships are weak. This is especially true in the current period when many high schools are trying to implement the "Common Core" curricula.

Given these realities, many of the successful pilots and company programs have focused on the post-secondary period. At the same time, the success of youth apprenticeship in Wisconsin and Georgia indicates that the U.S. can develop apprenticeships that mirror the age groups participating in the German Dual System.

ADOPTING GERMAN IHK AND OTHER CERTIFICATIONS TO STRENGTHEN CERTIFYING APPRENTICESHIP PROGRAMS IN THE U.S.

Enhancing the reputation of apprenticeships at the high school and post-secondary levels is a critical step for apprentices and employers. One way to do so is to build on the quality standards operating in Germany for selected occupations. Although not all occupations will be similar across countries, the German standards offer an excellent starting point for U.S. occupational standards linked to apprenticeship.

The German Vocational Training Act aims at providing apprentices with a firm foundation of basic skills, problem solving, critical thinking skills (reflectiveness), and specific occupational skills in order to tackle requirements from companies and customers. To quote from the Act, "Initial training shall, through a systematic training programme, impart the vocational skills, knowledge and qualifications (vocational competence) necessary to engage in a form of skilled occupational activity in a changing working world. Initial training shall also enable trainees to acquire the necessary occupational experience."

The advantages of links to the German skill standards are twofold. The first is reducing the hard work of determining the skill requirements relating to particular occupations. The second is quality assurance and portability. German standards resulted from a serious three-party agreement of employer organizations, trade unions, and government in which the needs of companies and workers are reconciled. Companies can tailor their training in part to their specific needs. At the same time, workers receive sufficiently general occupational training that allows them to be mobile and to grow over time in their careers. It is this balance and high quality that strengthens the reputation not only of particular apprenticeships, but also of the system as a whole. Meeting German standards in such occupations as mechatronics offers a benchmark against which U.S.-based firms can measure the quality of their training. As a small example, South Carolina's Apprenticeship Carolina has facilitated the use of German mechatronics standards for U.S. apprentices.

Whether or not U.S. programs apply German standards, the mechanisms for establishing occupational standards linked to apprenticeship should be simplified. One approach is to establish a type of "safe harbor" standards. A joint Office of Apprenticeship-Department of Commerce team could select occupational standards in consultation with selected employers who hire

workers in the occupation. Once selected, the standards could be published and made readily accessible. Employers who comply with these established standards could have a quick and easy path to registration of the program. In addition, workforce professionals trying to market apprenticeships would have a model that they can sell and that employers can adopt and/or make modest adjustments. Occupational standards used in Germany and other countries can serve as starting points to the Labor-Commerce team and to industry groups involved in setting standards and in illustrating curricula.

OTHER WAYS TO EXPAND THE ROLE OF DUAL SYSTEM PROGRAMS IN THE U.S.

EXPANDING MARKETING

Marketing is critical in the U.S., given today's limited scope and knowledge about apprenticeship as a dual system. The marketing could include a national initiative that promotes apprenticeship as a win-win for students, employers, and schools. At the same time, federal and state offices could engage or sponsor direct marketing and technical assistance to persuade individual firms to offer apprenticeships of high standards.

The U.S. state governments could build a state marketing campaign together with incentives and technical support to community colleges and other training organizations to market apprenticeships at the individual firm level. However, simply marketing to firms through existing federal and state agencies may not work if the staff lacks the marketing dynamism, sales talent, and passion for expanding apprenticeship. Pay for performance is recommended: technical education and training organizations would earn revenue only for additional apprenticeships that each college or organization managed to develop with employers. State and local governments could provide matching grants to fund units within technical training organizations to serve as marketing arms for apprenticeships. The marketing effort should encourage government employers as well as private employers to offer more apprenticeships.

MAKING INFORMATION ABOUT APPRENTICESHIP WIDELY AVAILABLE

The federal government could sponsor the development of an information clearinghouse, a peer support network, a matching service linking apprentice applicants and employers, and a research program on apprenticeship. The information clearinghouse could document the occupations that currently use apprenticeships not only in the U.S., but also in other countries along with the list of occupation skills that the apprentices master. It could include the curricula for classroom instruction, as well as the skills that apprentices should learn and master at the workplace. Included in the clearinghouse should be up-to-date information on available apprenticeships and on applicants looking for apprenticeships. The development of the information hub should involve agencies within the Department of Commerce as well as the OA.

The information clearinghouse would provide detailed examples of the youth apprenticeship programs in Georgia and Wisconsin. These states

offer apprenticeships that are the closest to the German dual system.

A research program could cover topics especially relevant to employers, such as the return to apprenticeship from the employer perspective and the net cost of sponsoring an apprentice after taking account of the apprentice's contribution to production. Other research could examine best practices for marketing apprenticeship, for incorporating classroom and work-based learning by sector, and for counseling potential apprentices.

DEVELOPING FUNDING AND TECHNICAL ASSISTANCE FOR CLASSROOM COMPONENTS OF APPRENTICESHIPS

A major challenge is to provide sufficient resources for delivering the vocational education linked to apprenticeships. In the U.S., employers and workers themselves usually pay the costs of what is sometimes called "related instruction." This is in sharp contrast to most other countries, where the government finances the learning outside the work site. Although the U.S. government recently clarified the use of college grants aimed for low and middle income families (Pell grants) for apprenticeship, applying these grants to finance classroom instruction is complicated. Direct subsidies for the classroom component would lower the costs of apprenticeships and likely increase the number of apprentices.

Technical assistance to community colleges and private career colleges can improve the way they interact and even market apprenticeships. Course schedules for regular students are usually inappropriate for students in apprenticeships. The coordination must extend to content as well. Which elements of instruction should take place at the workplace and which within the classroom is another challenge. A third challenge is to achieve the right balance between delivering responsive training programmes to local employers and offering content that has broad application, one that builds on talents and aptitudes of residents.

South Carolina's successful example involved collaboration between the technical college system, a special unit devoted to marketing apprenticeship, and a federal representative from the OA. In addition, teachers with technical colleges often serve as consultants to the development of apprenticeships, both in terms of related courses and the work-based component of apprenticeships. With a state budget for Apprenticeship Carolina of $1 million per year, as well as tax credits to employers of $1,000 per year per apprentice, the program managed to stimulate more than a six-fold increase in registered apprenticeship programs and a five-fold increase in apprentices. Especially striking is that these successes – including 4,000 added apprenticeships – took place as the economy entered a deep recession and lost millions of jobs. The costs per apprentice totaled only about $1,250 per apprentice calendar year, including the costs of the tax credit.

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