21st Century Apprenticeship Models:

A National Council for Continuing Education and Training White Paper

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Contents

The Problem: Employers need workers with industry-specific skills

U.S. employers find it difficult to attract and retain critical-skilled employees.

The Solution: Apprenticeship

History of United States Apprenticeships

People have been transferring skills from one generation to another in some form of apprenticeship throughout time. Although we do not have an abundance of evidence, apprenticeships have been around for more than 4,000 years. Once the principal means by which craft workers learned their trades, apprenticeship plays a relatively small part in American life today. (JD)

Early America apprenticeship started back in New England around 1640 with a man named Thomas Millard, a tailor. Records from the colonial period are sparse, but both Philadelphia and Boston have preserved important evidence. In Philadelphia, Quimby (1963) traced official apprenticeship back at least to 1716. By 1745, the city had recorded 149 indentures in 33 crafts. The stock of apprentices grew more rapidly than did population, and after an additional 25 years, it had reached 537. During this time, the apprentices were called Indentures. They usually were young adults with ages varying from 14 to 18 and were bound to a master to learn a specific trade. The name “indentures” came from the way the master tracked accomplishments by making indentures in a ledger. When they accumulated enough capital, journeymen set up shops as independent masters and became members of their craft guilds. These institutions had the power to bestow and withdraw rights and privileges upon their members and thereby to regulate competition among themselves. (JD) To this day, the term master continues for trades such as master electrician, carpenter and plumber.

Following the industrial revolution, the apprenticeship system was revolutionized to apply to the new machine. Apprentices began working for wage progression instead of food and shelter. In 1917, with the benefit of prior collaborations involving the public sector, a coalition of labor, business and social services secured passage of the Smith-Hughes Law to provide federal aid for vocational education. Despite this broad support, it is not clear that the bill would have passed had it not been for America's entry into the First World War and the attendant priority for an increase in the supply of skilled labor. Prior to this law, demands for skilled labor had been partially muted by new mass production technologies and scientific management, both of which reduced industry's reliance upon craft workers. (WS)

The depression in the early thirties stopped nearly all workforce training. Moreover, the prior industrial

transformation shifted power within organized labor from the American Federation of Labor's bedrock craft unions to the Congress of Industrial Organizations. (JD) Even so, by the late 1930s, shortages of skilled workers led to a national apprenticeship plan. Under the Fitzgerald Act (1937), apprenticeship standards were formalized and specified the type and quantity of training to be provided, as well as the responsibilities of joint labor-management apprenticeship committees. (JD) Standards helped minimize incentives to abuse low-wage apprentices through inadequate training and advancement. Nationally, however, the percentage of apprentices remained small, and overall, young people increasingly chose formal education rather than apprenticeships. The Fitzgerald Law worked to protect labor's immediate interests and few firms chose formal apprenticeships when less structured training was possible. (JD)

This system persisted through the heyday of organized labor in the forties and fifties, but began to come undone in the late sixties and seventies, particularly when Civil Rights groups attacked the racial and gender discrimination too often used to ration scarce apprenticeship opportunities. Discrimination was sometimes passive, occurring as the result of preferential treatment extended to the sons and friends of craft workers, while in other instances it involved active and deliberate policies aimed at exclusion (Hill, 1968).

Along with a declining influence of labor and civil rights organizations, work relations appear to have changed with the new millennium. Forms of labor contracting that provide fewer benefits and security are on the rise. Incomes once again have become more stratified by education and skill levels, making them a much more important issue. (JD) Gary Becker's (1964) work on human capital theory encouraged businessmen and educators to rethink the economics of training and apprenticeship. Conceptualizing training as an investment, theory suggests that enforceable long-term apprenticeships enable employers to increase their investments in the skills of their workers. Binding indentures are rationalized as efficient devices to prevent youths from absconding with the capital employers have invested in them. Armed with this understanding, increasingly policy makers have permitted and encouraged arrangements that look more like former employer-dominated apprenticeships. Whether this is the beginning of a new era for apprenticeship or merely a return to the prior battles over the abuses of one-sided employer control, only time will tell.

Rapid changes in our industrial system require a large body of skilled workers who are able to carry out technical specifications and who can supervise less skilled members of the workforce. Women in apprenticeship and in skilled craft jobs will become more numerous, and new opportunities will open up for minorities as non-discrimination requirements are enforced. Projections of employment opportunities show great needs for skilled workers. National projections of skilled worker requirements prepared by the Bureau of Labor Statistics, U.S. Department of Labor, indicate a rise in the number of skilled workers from 11 million in 1980 to 14 million in 1990. Apprenticeship has served in many periods of history. Today it is clear that apprenticeships remain one of the best ways of training skilled workers. But there is still much work to do. (WS)

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Benefits of 21st Century Apprenticeships

1. Apprenticeship programs create pathways to sustainable middle skill jobs, which is currently a national priority.

2. Apprenticeship programs help employers ensure they retain talented employees by offering them training for higher level positions and awarding nationally recognized credentials.

3. Apprenticeship programs help employers train new employees who have the professional skills they are looking for but lack critical technical skills.

4. Many companies design customized apprenticeship programs specifically for their business needs. These programs might or might not be registered with the U.S. Department of Labor, based on industry requirements. Recognition by other national accrediting organizations may be an important addition to DOL.

5. Apprenticeships are originating from community college continuing education and corporate training departments rather than traditional academic departments as they were in the past.

A Student's Story: Lone Star College System

When Osbaldo "Ozzy" Gonzalez came to Lone Star College in the fall of 2010, he was a fabricator for a sign company.

"I thought I was a welder when I got here!" said Gonzalez. "I needed more skills."

Gonzalez started taking welding courses at LSC-CyFair.

"I loved it," he said. "Every time I went, I learned something new."

Now, Gonzalez is continuing his education in welding at LSC-Conroe Center. He says his newfound skills have already paid off, earning him a raise of $7 an hour at his job and saving him thousands of dollars in an unexpected situation.

A few months ago, Gonzalez loaned his car to a friend. However, after his friend got into an accident, Gonzalez was facing $4,500 in repairs. Instead of sending his car to the repair shop, Gonzalez put his welding skills to practical use, fixed his own car and only spent $900.

"I've come a long way," said Gonzalez.

Lone Star College System

Pre-apprentice programs targeting at-risk populations and providing pathways to sustainable careers

Pre-apprenticeship programs are a great way to start exploring careers in a variety of trades (masonry, carpentry, HVAC, electrical, plumbing, machining, maintenance and construction). These programs offer an overview of each trade, the qualifications and skills needed for each trade, on-the-job training and related college based instruction. Pre-apprentice programs also offer career-entry advice, job coaching and emphasize the importance of succeeding in school and in the workforce.

The main purpose of the LSC pre-apprenticeship programs is to provide an opportunity for those wishing to gain employment in an industry they hope to work in. The LCS Pre-Apprenticeship initiative was intended to increase the number of pre-apprenticeship training opportunities available in the Houston area, provide a secondary pathway for school leavers considering trade training, providing an opportunity to test their interest and commitment to a longer term trade training arrangement; provide individuals with a greater understanding of the training and work components of a specific trade. While pre-apprenticeship does not guarantee a job, hiring employers should know pre-apprenticeship graduates have a higher rate of success in the workplace and many graduates get jobs during and after training. LSC pre-apprenticeships are aimed at early school leavers, the unemployed and those in career transition who wish to return to the workforce. Pre-apprenticeship programs are designed to improve participants' chances of gaining entry-level employment or entry into a formal apprenticeship program. However, anyone wishing to improve skills and gain insight in an area of interest can enroll in the instructional part of the program offered at the college. In today's competitive world, it can be difficult to gain employment without experience; pre-apprenticeships can give participants an edge and influence potential employers to hire upon completion.

An often overlooked step in the training process is the identification of skills gaps that prevent acceptance into a viable trade as an entry-level employee. The most common barriers found across the country are low math skills, lack of knowledge of the different trades, poor work skills, and no driver's license. Pre-apprenticeship training is frequently targeted at traditional trades and has a greater focus on industry specific skills over general employability skills. This training generally involves both theoretical and work experience components to prepare individuals for the job they intend to pursue. Also by completing course work from the program one can provide exemptions from subjects studied in the first year of a formal apprenticeship. Pre-apprenticeships can actually reduce the study workload in subsequent years.

While curriculum is important to pre-apprenticeship, LSC feels the key is the relationship that is built between the training staff and the student. LSC strives for an environment of trust and respect combined with high

instructional standards that mirror the chosen industry. This relationship begins with the first contact with the student. Separating recruitment, training and support services could undermine this relationship. Pre-apprenticeship programs can be sponsored by individual employers, joint employer and labor groups, and/or employer associations.

Participants in the LSC pre-apprenticeship programs will benefit as follows:

- Earn more pay for developing a high in-demand skilled trade
- Earn while you learn – work in the field of study in an internship or coop experience
- Gain hands-on, in-depth, competency based training in a specific field
- No previous experience needed to succeed
- Opportunity for immediate employment after training
- Portable credentials recognized nationally and often globally
- The opportunity for college credit and future degrees and certificates.
- Get an edge on the competition in today workforce pool

For the employer of graduates from the program, benefits would be:

- A skilled worker pool trained to industry/employee specification to produce quality a results
- Reduced turnover in employee tenure
- A pipeline for new skilled workers
- Reduced worker compensation cost due to an emphasis on safety training

Pre-apprentices work to specific entry-level standards designed to prepare them for the full apprenticeship training or entry-level employment. Participants in the LSC pre-apprenticeship programs will gain entry-level skills that reinforce safe work practices and working with the latest advanced technologies and tools. Participants will also get real world experience fabricating, building and troubleshooting complex industrial or manufacturing parts and systems.

Currently LSC offers numerous certificates and customized courses to support the manufacturing machining sectors. In continuing education the Machine Shop Assistant and Machine Tool (CNC) Operator Certificates. In credit we offer three certificates; Computer Numerical Control I and II and Machinist 1 Certificate. Students are required to complete the first certificate before moving to the next certificate. Both programs involve a total of five to six courses across the two certificates.

Fortunately, we have identified numerous companies in the north Houston area that are in immediate need of hundreds of machinists. The current certificates are lengthy in duration and take approximately seven to nine months to complete.

Therefore, LSC created the Pre-Apprenticeship Certificate, a 164 contact hour foundation course that will be scheduled three times during one year. The new certificate, “Machining Pre-Apprenticeship,” would be offered during the morning in a four-hour block, five days a week and on some Saturdays. The target audience for this program is unemployed or recent grads looking for work. While the individual course curriculum and hours would not change in the current CE program, the new offering would now be focused on a quick turnaround workforce program that can be offered more times a year and would meet the high demand for basic skilled machine shop employees. The new program is below:

Machining Pre-Apprentice Certification Program

This fast-track program is designed for students to obtain their machining pre-apprentice certification in as little as six weeks. Students will also receive the OSHA 10-Hour General Industry Certification, as well as forklift operator certification.

Offered at LSC-Conroe Center beginning January 2012.

Course	Course #	Contact Hrs.
Machining Pre-Apprentice	MCHNC 2103807	144
OSHA 10-Hr General Industry Certification	OSHTC 2101501	10
Forklift Operator Orientation	CNSEC 2109301	8
	Total Contact Hours	162

LSC believes this new certificate will allow future open enrollment CE machining students to save money, save time and find a job quicker than the present LSC CE workforce machining certificate, which is geared for national certification and articulation to credit certificates. By allowing the CE and Credit classes and to fulfill the NIMS requirements, this new certificate better aligns the CE machining program to meet industry needs.

A Student's Story: Midlands Technical College

While Midlands Technical College is engaged in numerous non-traditional apprenticeships, traditional apprenticeship programs remain strong at the college.

Not able to reach his career goal, Allen Knotts made the decision to leave a well-paying job to become an electrician apprentice for a local hospital. His decision has taken him to new heights.

"After years of trying to transfer into the electrical trade department of the local power plant, I had an opportunity to join Palmetto Health as an electrician apprentice," said Knotts. "At first, I was apprehensive because I was going from one of the state's most prized companies to having my salary cut in half and going back to school."

"The apprenticeship program was a four-year program that required 8,000 hours of on-the-job training along with an industrial electrical diploma program at Midlands Technical College," continued Knotts. "However, with my prior Navy experience, I was given credit for 4,000 hours. By going to school year-round and taking night classes, I finished the apprenticeship electrical diploma and my associate's degree in less than 18 months."

"Once I obtained my Electrical Journeyman's license, I helped develop the electrical training program in conjunction with MGI systems to have all of the electricians at the Richland Campus certified as Health Care Electricians."

"Currently, I am working on my bachelor of science in electrical engineering technology. The Palmetto Health Apprenticeship Program has given me the opportunity to take my field experience and education to move to new heights."

"It amazes me to see how the apprenticeship program became such a positive factor in my career here at Palmetto Health."

Midlands Technical College

Helping employers build critical skills through traditional and non-traditional apprenticeships

In South Carolina, employer-sponsored apprenticeship programs are helping to build a highly skilled workforce and provide employees with a path to advance their careers and increase their earnings. In addition to the traditional trade models, South Carolina employers operate successful apprenticeships in occupations such as information technology, health care, tourism, and transportation.

Midlands Technical College, located in Columbia, SC, works hand-in-hand with ApprenticeshipCarolina, a division of the state's technical college system, to educate employers on the value of registered apprenticeship programs. A key to the South Carolina model is the Regional Apprenticeship Consultants who assist the colleges and employers in the process of designing and registering apprenticeship programs with the Department of Labor. The consultants work hand-in-hand with employers and the Department of Labor to ensure employer programs meet all requirements and standards of federally registered apprenticeship programs.

"We see registered apprenticeship programs as a unique opportunity for employers to strategically grow their own workforce," said Donna Lawrence, Program Director with Corporate and Continuing Education at Midlands Technical College. "Employers recognize registered apprenticeships provide a structured system to design and deliver training and education programs that build specific competencies, which are mission critical to their organizations."

Presently, Midlands Technical College is a partner with more than 50 organizations in a variety of apprenticeship programs for occupations, such as dietary manager, health information systems support analyst, project manager, and landscape manager.

One employer capitalizing on the power of apprenticeships as a strategic workforce development tool is BlueCross BlueShield of South Carolina. The largest employer of IT professionals in the state with more than 2,200 IT employees, BlueCross BlueShield was faced with the challenge of building a highly skilled workforce to process more than 800 billion insurance transactions a year.

To meet the challenge, BlueCross BlueShield established the state's first nationally registered apprenticeship for IT occupations of programmer analyst, web systems support programmer and network support tech. Using occupational data from the U.S. Department of Labor, BlueCross BlueShield identified the skills and competencies required for proficiency in each job to be apprenticed. Then, the organization worked with Midlands Technical College and ApprenticeshipCarolina to document the on-the-job training and classroom education required for each job. BlueCross BlueShield developed a pay progression for employees who successfully complete the apprenticeships. To help employers like BlueCross BlueShield fund expenses

associated with apprenticeship programs, the state of SC provides a tax credit of $1,000 per apprentice per year for up to four years.

“Apprenticeship programs are a great way for us to grow our own experts in the information technology field,” reports David Riddle, IS/capability programs and curriculum manager.

Midlands Technical College works closely with BlueCross BlueShield to provide components of the technical curriculum, including A+ IT Technician, Network+ Technician, Microsoft Server - Active Directory / Server Administrator and Cisco Certified Network Associate.

“The program is successful,” said Brenda Graham-Love, IS Training Operations Manager for BlueCross BlueShield. “Employees learn a trade or profession from entry-level to intermediate or advanced level. It is a great opportunity for new college graduates to advance in the workforce.”

With the success of the IT program, BlueCross BlueShield has launched a new registered apprenticeship for customer service employees in their National Alliance Division. In this program, Midlands Technical College will provide more than 50 hours of training and education in customer service skills.

Another business partnering with Midlands Technical College to leverage the advantage of apprenticeships is Biowatch Medical Incorporated, which markets a patented cardiac arrhythmia monitoring service.

Biowatch developed a federally-recognized apprenticeship for Cardiac Care Technicians that features in-depth education and training in cardiac care, medical terminology, CPR and computer skills instructed almost entirely by Midlands Technical College. The Biowatch program prepares apprentices for industry certification from Cardiovascular Credentialing International.

“From the start, Biowatch Medical has been a very innovative company,” said Jessica Bocker, VP of marketing. “This type of innovation requires a highly skilled, dedicated workforce. This apprenticeship program allows us to reward this dedication by enhancing the skills of our employees.”

The Biowatch apprenticeship is an 18-month program with 218 hours of job-related education consisting of classroom, lab and self-paced learning.

Presently, there are 3,123 apprenticeship programs in South Carolina, including 286 national registered apprenticeship programs. Having experienced impacts such as decreased turn-over, improved productivity, decreased safety incidents, and improved consistency and structure in workforce training, employers value the positive results apprenticeships have on their organizations and their individual employees.

To help employers provide effective on-the-job training (OJT), a required component of registered apprenticeship programs, Midlands Technical College conducts courses to training operational managers to design and execute OJT.

Strong collaboration among federal and state agencies and commitment from the state to grow apprenticeship programs as a vehicle for economic development make South Carolina’s initiative powerful and unique.

A Student's Story: Three Rivers Community College

John Worobey, Apprentice Program Administrator for EB, commented the company is committed to employee education and the collaboration has assisted with recruitment and retention, especially of highly motivated employees. The program provides an incentive for employees to complete their associate's degree which bridges into a four year bachelor's degree. Many students take courses on their own time in an effort to accelerate the process.

One extremely motivated student is arrangement apprentice Penny Myllymaki. Ms. Myllymaki was employed at a dry cleaning business for ten years when a friend referred her to EB. She had successfully taken drafting classes in high school and was hired as an apprentice five years ago. She is currently three years into her five year apprenticeship program with four classes left to finish her associate's degree. With a baby on the way Ms. Myllymaki "doubled up" her course load, taking classes on her own time, in order to complete as much coursework as possible. She doubts she would have been able to attend college without the apprenticeship program and company benefits. Like so many community college students, time and finances were major obstacles to higher education. Once she completes her associate's degree she intends to continue her education at a four year institution and remain at EB. She noted, "EB gave me a great opportunity…education has helped me to be better at my job and it's something that I'll have forever."

Employment and education are a family affair for Penny Myllymaki. Her husband, Dean Myllymaki, had an associate's degree but didn't have the requisite drafting skills to be hired at EB. So he completed a TRCC/EB/Workforce Investment Board sponsored pre-drafting employment program, which combined online learning with professor mentorship. After completing the pre-employment program, Dean was hired as a mechanical apprentice and intends to earn a bachelor's degree at the conclusion of his apprenticeship.

The EB Apprenticeship/Associate Degree and Pre-Employment Drafting program were recognized as exemplary workforce development initiatives and received two 2009 CT Economic Development Awards. In addition EB presented the program at the 2009 Eastern Seaboard Conference. TRCC is proud of its alliance with EB, and commitment to creating educational pathways to sustainable careers for residents of southeastern CT.

Three Rivers Community College

Keeping America Competitive: Workforce Development Solutions for the Submarine Capital of the World

Established in 1899, General Dynamic Electric Boat of Groton (GDEB), CT has established standards of excellence in the design, construction and lifecycle support of submarines for the U.S. Navy. Primary operations are the shipyard in Groton, CT, the automated hull-fabrication and outfitting facility in Quonset Point, RI, and an engineering building in New London, CT.

In 2008, Electric Boat (EB) approached Three Rivers Community College (TRCC) in Norwich, CT regarding challenges faced by the defense industry to recruit and retain several hundred new drafting employees in the Connecticut Department of Labor (CTDOL) Marine Drafting Apprenticeship (MDA) Program. This CTDOL registered apprenticeship combines on-the-job training with related classroom instruction. The Connecticut Department of Labor's Office of Apprenticeship Training is responsible for registering apprenticeship programs that meet federal and state standards and issues certificates of completion. Companies that sponsor CTDOL registered apprenticeship programs receive tax incentives from the State of CT.

TRCC, EB, MDA, The CTDOL formed an innovative collaboration to address this workforce challenge. The state approved apprenticeship program curriculum was evaluated by TRCC professors for nontraditional college credit for transfer into one of the following Engineering Technology Associate Degree Programs:

- Electrical
- General
- Manufacturing
- Mechanical
- Nuclear
- Engineering Technology

All are accredited by the New England Association of Schools and Colleges, and all but the General Option is accredited by Technology Accreditation Commission of the Accreditation Board for Engineering and Technology, Inc. (TAC-ABET). TRCC faculty performed an extensive credit analysis of the apprenticeship programs and determined students can receive between 21 and 26 college credits for experience, providing a jump start toward the completion of an associate's degree.

Company and college sponsored information sessions were held with the employees to explain the program benefits and student obligations. After the information sessions were completed, students applied for entry into the program. Once accepted, TRCC and EB personnel implemented customized placement testing and advising sessions. Students are currently enrolled in coursework at the College or on-site classes at the worksite.

The five-year program includes more than 8,000 hours of on-the-job training, more than 2,000 hours of design specific

instruction and 720 hours of classroom training. The EB specific component is taught by on-site company instructors, while the credit classes are taught by TRCC faculty. Students attend classes during the work day, receiving training directly related to their careers. When they complete their apprentice programs, the participants continue to complete their associate's degree. Tuition costs are fully paid by the company for apprentices who earn a "C" or better. Once students receive their associate's degrees the company's tuition reimbursement program will support four-year degrees in industrial technology, engineering technology or engineering. In 2008 approximately 160 MDA members participated in the program. Currently 85 students are enrolled and five students earned associate's degrees in 2011, with another student graduating in May 2012.

Cooperative Program Allows Designers to Complete Apprenticeships, Earn Associate's Degrees

Electric Boat, the MDA-UAW and Three Rivers Community College (TRCC) have established a partnership that enables designer apprentices to earn associate's degrees in engineering technology while the company pays the cost.

At a ceremony held recently at the Technology Center to officially kick off the program, Electric Boat President John Casey said the partnership reflects the company's commitment to training and education, and demonstrates the active role the state is taking to build the educated workforce that will be required to compete and succeed in the current and future business environment.

Manager of Training Cathy White said the five-year program includes more than 8,000 hours of on-the-job training, more than 2,000 hours of design-specific instruction and 720 hours of classroom training.

The Electric Boat-specific content is taught on-site by company instructors, while the academic classes are taught by TRCC staff, White said. Program participants attend classes during the work day, receiving training directly related to their careers. When they complete their apprentice programs, the participants should be able to complete the requirements for their associate's degree in about a year, said White.

Nearly 160 MDA members are taking part in the program, attending classes on company time and at their normal pay rate. Tuition costs are fully paid by the company for apprentices who earn grades of "C" or better, White said.

Additionally, the program is structured to allow participants who have obtained their associate's degrees to pursue four-year degrees in industrial technology, engineering technology or engineering through the company's tuition reimbursement program.

Acting MDA-UAW President Bill Giustini expressed support for the program and the cooperative relationship between the union, company and the community college. TRCC President Grace Jones said the agreement demonstrates the school's commitment to local business and industry and "continues to grow what is the future work force for this area."

(This article appeared in Electric Boat News, November/December 2008).

A Student's Story: Polk State College

Despite earning a college scholarship, Bryan Hogue, now 22, decided to pursue construction career upon graduating early from Plant City's Durant High School in January 2006. On January 26, 2006, the day he turned 18, he became a superintendent and started traveling around the United States building stores in malls. Even though the work and pay were great, Bryan decided to move back home, put down roots, and go back to school, but he still needed to work. Bryan said, "Growing up I was raised by two great parents, Steve and Cathy Hogue, who would do anything to help or support me. I did not grow up poor or rich, so I learned how to work at a young age. I was taught if I wanted something I was going to have to work for it in order to get it."

After completing a 13-month electrical program in nine months at a trade school while working, Bryan discovered a Mosaic Company job posting for electrical trainees, including an opportunity to enroll in a two-year apprenticeship program. This is how Bryan found his way Polk State College, through the College's maintenance crafts apprenticeship program which includes three days a week of on-the-job training with Mosaic and two 8-hour days of coursework at Polk State. Bryan said, "One of the biggest obstacles is sitting in a classroom eight straight hours a day, knowing we are going to be here for the next 2 years. Luckily, we have a great group of guys in our class of 16. If it wasn't for all of us becoming such close friends, the time wouldn't have passed nearly as fast." After completing his apprenticeship program and obtaining his journeyman certificate, Bryan took 31 credit hours of articulated college credit from the apprenticeship program to Polk State's Engineering Technology degree.

Polk State College's Associate of Science degree in Engineering Technology is designed to meet Florida's need for a highly skilled, well-trained, and technically competent workforce in manufacturing to meet the challenges of ever changing and complex manufacturing processes. The AS degree in Engineering Technology can serve as a terminal degree or the first step of a 2+2 program leading to a bachelor's degree, either in a technical area or in management. The core of the degree is closely aligned with the national Manufacturing Skill Standards Council (MSSC) Certified Production Technician (CPT) industry certification.

Bryan graduated in the spring of 2011 with an AS in Engineering Technology. "Polk has done a great job scheduling and planning classes around a working man's schedule. If anyone is in the same situation that I was in and thinks they can't go to school and work, I encourage them to look into this degree or any of Polk State's other great career opportunities," Bryan said. Bryan thanks everyone at Polk State College, his supervisors and coworkers for teaching him what he needed to take full advantage of the opportunity and get to where he is today. Bryan concludes, "I'm currently living in Dover, Florida, and proud to say last year at the age of 21 I purchased my first house. I can honestly say I've worked extremely hard to get where I am today."

Polk State College

Creation of a Multi-Skill Manufacturing Apprenticeship Program with Articulated Pathways into Engineering Technology

In alignment with the creation of a unified educational pathway for Florida's manufacturing workforce, Polk State College (PSC), the Employ Florida Banner Center for Manufacturing, The Mosaic Company (Mosaic), Rockwell Automation, and RWD Technologies have created an apprenticeship program that aligns with national certifications, corporate training of the incumbent workforce, and articulated credit into an Associate in Science (A.S.) degree in Engineering Technology with an Advanced Manufacturing specialization. This reform has resulted in a program that prepares the skilled craft workforce while providing academic credit and pathways into the statewide degree in Engineering Technology.

To address the current skills shortage, an immediate need for new multi-skill maintenance personnel, concerns about the impending retirements, and small pool of talent in the pipeline experienced by the local manufacturing community, PSC Corporate College has partnered with the Banner Center for Manufacturing, training partners and Mosaic to create and offer structured competency-based apprenticeship training. This program includes apprenticeship training for both Electrical Instrumentation and Automation Technicians (EIA) and Mechanical/Millwright Craft. The program was created to align with the Department of Education's Journeyman requirements and consists of 1,232 hours classroom instruction combined with on the job training (OJT). Specifically, the program consists of the following instruction:

- The Banner Center's "Manufacturing Essentials" curriculum aligned with the MSSC CPT national certification – five weeks;
- Industrial skills fundamentals curriculum – 18 weeks;
- Trade-specific skills curriculum – 12 to 18 months;
- Advanced standing for current incumbents to meet program requirements;
- Employer provided hands-on OJT

Upon completion of the apprenticeship program, the participants are elevated to full journeyman status at Mosaic and obtain a pathway into PSC's Engineering Technology degree program. Due to the inclusion of the MSSC CPT certification into the program, participants who successfully earn their CPT are offered 15 credit hours toward the technical core of the degree based on a statewide articulation pathway already established in Florida. Then, based on the rigor of the technical training in the apprenticeship program, an additional 16 credit hours are articulated through internal articulation agreements between the corporate college and the academic department. These 31 credit hours build a strong pathway to a degree designed to meet Florida's need for a highly skilled, well-trained, and technically competent workforce in manufacturing helping to meet the challenges of ever changing and increasingly

complex manufacturing processes. The degree program provides the fundamentals of production processes, the maintenance of those processes, quality assurance, and safety, followed by more in-depth study of automation and instrumentation, metrology, process improvements, total predictive maintenance, technical management competencies, as well as quality work practices utilizing Lean and Six Sigma principles.

MSSC CPT Articulation to the E.T. AS Degree

Course Number	Course Name & Credits
ETM 1010C	Mechanical Measurement & Instrumentation (3)
ETI 1110	Introduction to Quality (3)
EET 1083C	Introduction to Electronics (3)
ETI 1701	Industrial Safety (3)
ETI 1420	Manufacturing Processes & Materials (3)

PSC Internal Articulation to the E.T. AS Degree

Course Number	Course Name & Credits
EST 1542	Introduction to Programmable Logic Controllers (3)
EST 1511	Motors and Controls (3)
ETM 2315C	Hydraulics & Pneumatics (4)
EST 1540	Industrial Applications using PLCs & Robotics (3)
EST 1535	Automated Process Control (3)

The AS in Engineering Technology degree can serve as either a terminal degree or the first step of a 2 + 2 program leading to a bachelor's degree, either in a technical area or in management.

Through the development and implementation process, Mosaic, PSC, the Banner Center for Manufacturing, and RWD identified the following "lessons learned:"

- Participant selection is important
  - Work experience
  - Academic background
- Identification of national industry certifications is essential
- Focus on development of regional and statewide articulation pathways
- Pace for the related classroom instruction is slower than college level
  - Test taking/Study habits
  - Reinforce Mathematics
- Synchronization of OJT tasks and the related technical instruction is essential
- Industrial needs are specialized
- Multi-source text and materials
- State approval process time consuming
- Must have experienced instructors
- Flexible content with local decisions
- Client wants earlier practical skills embedded in the delivery
- Find industry standard curricula and vendor certifications that add value and can serve as completion points.

Registered apprenticeship benefits employers by providing them with a pipeline of skilled workers with industry-specific training and hands-on experience. Registered apprenticeship programs are customizable to match employers' needs, and highly flexible to meet employers' changing requirements. With careful design of the registered apprenticeship program, participants can be offered education that aligns with national industry certifications and pathways into higher education.

Conclusion: Going Forward

These college models are just four examples of successful programs across the nation, illustrating the multiple approaches and significant results employers and individuals are achieving through structured apprenticeship programs.

Apprenticeship programs are a valuable tool to help employers attract, develop, and retain the skilled employees needed to accomplish their organizational goals in a short period of time. For individuals seeking upward mobility, apprenticeships provide a pathway to higher education, increased earnings, and sustainable careers. At a time when America is experiencing a shortage of skilled workers, apprenticeships provide a structured approach to fill the high tech, middle-skill jobs required to boost the nation's economy.

Community college continuing education and customized training departments are taking a leadership role in working with employers to develop modern-day apprenticeship programs that are reflective of individual business needs. On a national level, the United States Department of Labor has launched a multi-agency consortium to advance articulation of Registered Apprenticeship (RA) to college credit as an important opportunity for apprentices to earn an associate's or bachelor's degree. Increasing College Opportunities for Apprentices: Community College–Registered Apprenticeship Articulation Strategy will formulate the consortium framework that will be presented at the AACC national convention in April 2012. An outreach campaign will be launched to build the consortium and identify new schools to join the 1,660 existing Registered Apprenticeship-Community College articulation agreements.

The National Council for Continuing Education and Training applauds the administrations' recognition of the importance of apprenticeship programs and will continue to support the increase of opportunities nationwide. The Council looks forward to promoting and supporting apprenticeship programs as an important strategy to grow tomorrow's workforce and revitalize the nation's economic engine.