



Florida's Model for Industry-Technical Education Partnerships

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Michael Ennis is a Manufacturing Engineer for Harris Government Communications Division and an Adjunct Professor at Brevard Community College in Palm Bay, Florida. Harris is an international communications and information technology company serving government and commercial markets in more than 150 countries. Headquartered in Melbourne, Florida, the company has approximately \$5 billion of annual revenue and 15,000 employees-including nearly 7,000 engineers and scientists. Harris is dedicated to developing best-in-class assured communication products, systems and services. Ennis is currently an engineer in the Facilities Engineering department. Ennis received the Harris "President's Award for Personal Growth and Fulfillment" in 2006 for his work in establishing an Applied Associates of Science degree program for Harris employees. In 2009, Michael received the "Industry Distinguished Service Award" from the Florida Advanced Technological Education Center for his work with the local high schools and community college. Ennis teaches engineering courses at Brevard Community College. He is a credentialed Instructor for Applied Mechanics with Lab, Industrial Safety, and Introduction to Quality Assurance, as well as IPC Certified to instruct Soldering Rework and Repair. Ennis has a Master's of Science degree in the Management of Technology from the University of Miami in Coral Gables, Florida. Michael's professional career began at Kennedy Space Center, Florida. He started as a Technician for McDonnell-Douglas in 1982 working on Space Shuttle Payloads. He progressed to a Senior Facility Systems Engineer by his departure in 2000. From KSC, Ennis moved to Washington DC for a position as Project Manager for Total Resource Management implementing Maximo Enterprise Computerized Maintenance Management Software. Ennis moved back to Florida in 2004, where he went to work for Harris.

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Abstract

There is no question that industry and technical education programs have always understood the value that each can bring to the table with respect to the preparation of a skilled technician workforce. There is a question as to what an efficient and effective industry partnership program should look like. Several years ago, FLATE (the Florida Advanced Technology Education Center) the NSF-ATE Regional Center of Excellence for Manufacturing Education developed a taskforce that included representation from the Florida Department of Education, the Florida State College system, the College of Engineering at the University of South Florida, Florida's regional manufacturing associations, FLATE industry partners, and representatives from manufacturers that have partnerships with specific two year technician programs to design and implement a model program for developing and supporting industry/ technical education partnerships. The result of this effort are now assimilated into a coordinated plan, the "Florida Plan", that is creating an industry/education interaction strategy for technical education. This paper summarizes the important characteristics of the "Florida Plan" as it relates to industry/education partnerships. The paper will use a major Florida manufacturer, Harris Corporation, as a model industry/education partnership for Florida. The paper describes Harris Corporation's specific efforts as related to proactive interaction with their community college partner, and participation in the FLATE designed and Florida Department of Education implemented statewide articulated A.S. Engineering Technology program.

Genesis for the "Florida Plan"

The inspiration for the "Florida Plan" for technician education began with the Florida Career and Professional Education (CAPE) act for Florida's high school career academies(1). This legislature called for an academic structure that included industry certifications and articulations using those certifications along with new learning and teaching strategies such as learning communities, problem based learning, hands-on skills based learning for 21st century careers, and more. After high school, students would apply their skills and learning in college and careers supporting Florida's advanced manufacturing workforce. During the same time period, the Florida Advanced Technological Education Center (FLATE), an NSF Regional Center of Excellence for advanced technical education, had partnered with Florida's manufacturing sector and the Florida Department of Education (FLDOE), to design, create, and implement a statewide Engineering Technology (ET) Degree program that proved to be a best practice example of the "Florida Plan" to align and articulate A.S. degree programs from high school to college and support college and career readiness through a statewide coordinated effort.

The driving force behind the "Florida Plan" is the State's manufacturing sector with its span of facility sizes that range from 5 to 4,000 technical employees. Florida advanced manufacturing is critical to the state and national economy. The State of Florida has the fourth largest population in the country, with a current estimate of 18.5 million persons. Florida's annual high tech

export's value is rank 3rd in the nation. By 2008 there were 24,515 high-tech firms supporting over 290,000 high tech workers in Florida. The value of Florida-originated exports totaled nearly \$46.9 billion in 2009 and 85% of Florida's exports are manufactured goods (Enterprise Florida, 2010). Florida led the Southeast in high-tech employment and ranked 4th nationwide. Florida's high-tech workers earned an average wage of \$68,159, 72% higher than the statewide average private sector wage. By the end of the decade, Florida was among the top ten U.S. states in electronic components manufacturing (11,874 jobs), semiconductor manufacturing (8,259 jobs), electro-medical equipment manufacturing (3,540 jobs), and consumer electronics manufacturing. Nationwide, it has been observed that the educational attainment of the manufacturing workforce has been increasing; more than half of manufacturing workers have completed some college education (U.S. Dept. of Commerce, May, 2012).

Harris Corporation is a Florida-based company with a commanding share of the national and international market in telecommunications. Product lines include wireless equipment, electronic systems as well as both terrestrial and space-borne antennas for use in the government, commercial and defense sectors. The company is the largest private-sector employer in Brevard County, Florida's Space Coast, with over 6,000 of their 15,000 employees worldwide at plants in Brevard County. As of 2009 Harris was one of the top 100 federal contractors. Harris Corporation has a long standing corporate culture that helps shape the careers of engineering undergraduate and postgraduate students. This integration of education with career path success is also evident in the multiple ways Harris supports the "Florida Plan" for technician education via its technical education partnership activities.

In summary, the focus of reform and expansion of engineering technician education was planned to support the critical workforce needs of Florida manufacturers, as well as support for emerging technology business sectors. Legislation for career education (CAPE Act) was passed to meet this statewide workforce requirement. FLATE's flexible college and career pathway (Figure 1.) was created for Florida students and incumbent workers in order to prepare them with the education, skills, and credentials to support both small and large manufacturers, and to create a trained workforce for Florida which would have a positive impact on the economy and attract new business enterprises to the state. The restructure of the A.S. Degree for engineering technology education statewide required the direct address of significant challenges connected to industry relevance, student recruitment, curriculum content, and faculty professional development. The complexity of this higher technical education transformation is best described in five phases: Research and Planning; Design and Development; Implementation; Sustainability; Evaluation. Each phase provides a systemic and integrated process for FLATE's engineering technology education model which continues to expand geographically, grow in enrollment, increase academic and industry partnerships, and provide engineering technicians ready to work in today's advanced technology industry sectors.

The Plan's Phases

The phrase "Florida Plan" was coined to capture the synergy of these five phases and the A.S. Engineering Technology (ET) degree program became the first comprehensive implementation of the Plan in the State. The Research and Planning phase requires cooperation with and statewide action by the FLDOE Division of Adult and Career Education, the division holding

programmatic curriculum frameworks. For degree programs that support manufacturing, a delegation composed of the FLDOE, industry, educators, and FLATE is charged with the assignment to review, critique, and suggest reforms for the statewide Curriculum Frameworks as the first step. When required a readjustment and consolidation of course numbers within the statewide Course Numbering System to match a course’s new or modified knowledge and skills deliverables is undertaken. The streamlining of course numbering simplifies course alignment to FLDOE Frameworks; enhances ease of adoption by colleges; aides student transfer among state colleges and; strengthens degree/skill recognition by manufacturers hiring program graduates.

The Plan’s Design and Development phase requires the blending of knowledge plus skill acquisition modes to represent an optimal investment of manufacturers’ resources, college program content, and technical program duration. The Plan addresses manufacturer’s stated desire to integrate industry certifications with academic programs and to produce graduates who are “work ready”. FLATE elected, in the Implementation phase, to initially integrate the MSSC Certified Production Technician (MSSC-CPT) as its model articulated industry recognized certification at the entry level skill domain and to craft an articulation process for this new characteristic into a state-wide system. This strategy allows for articulation with high school programs aligned to MSSC, directly supported by the CAPE legislation, as well as define a best practice for integrating additional certifications into A.S. degree programs. The approach also allows anyone holding the MSSC-CPT to substitute that certification for the Core ET courses(2). Entrance/exit pathway options and course of study for Florida’s A.S. Engineering Technology Degree are provided in Figure 1. Extensive details about the degree are available(3).

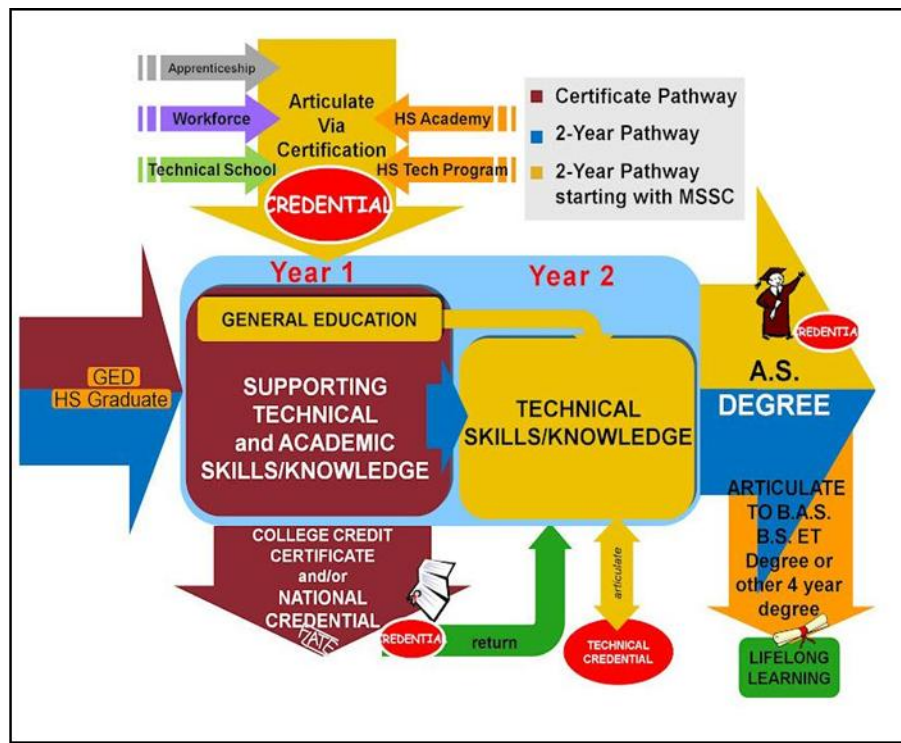


Figure 1. Florida’s A.S. ET Degree with Flexible College and Career Pathway Options

The Implementation of the ET degree as a representative of a “Florida Plan” program included addressing challenges associated with making directors of existing colleges programs recognize the value in a shift to the new integrated credential approach. This new approach also puts pressure on existing program personnel. The faculties “old” skills and knowledge base are still important but it will also be necessary to strengthen faculty knowledge base to deliver new content in order to satisfy specific requirements associated with credentials identified by industry within the college’s service region(4).

The Sustainability and Evaluation phases are intertwined. A specific technician development degree program will only survive if it creates technicians that industry deems valuable. Ultimately, that value is determined by the industry the program services. For the college offering the program, the challenges are focused on the growth of the degree program and the success of the students within that program. For Florida’s ET degree program, that success is linked to MSSC-CPT pass rates as well as perceived value that certification and degree specialization have within Florida’s manufacturing community(2).

Industry/Academic Partnership Options that Support “Florida Plan”

Sometimes obvious points need to be emphasized. In this case, the operational characteristics of the “Florida Plan” require industry involvement! The ET A.S. degree with its Specializations as a model curriculum for the Plan is built on industry involvement. “Florida Plan” partnerships can include a variety of interactions between the manufacturer and the education system. Fundamentally, these partnerships are created, driven, and sustained by the people within the two organizations and may engage people in various work areas at both institutions. This includes teachers, career counselors, educational administrators, human resources professionals, engineers, plant managers, and company training personnel. Some of the shared activities will be formal and others will not. The list below represents interactions/activities options that might be part of an exemplary, well-established partnership between a school/college and a manufacturer in Florida. These options are transportable for partnership building in any part of the country with a variety of industry participants. Several items have been grouped together to both simplify the list and emphasis that these activities may be called by different names.

- Scholarships/Tuition Assistance/Reimbursement
- Internships/Externships/Work Experience
- Student/Faculty Mentoring
- Industry Demo Projects/Facility Loan
- Tours and Talks
- Funding/Access to Equipment
- Adjunct Faculty and On-site Courses
- Advisory Board Participation/Curriculum Development Help

A strong and sustainable partnership is broad (includes a mix of interactions) as well as deep (involves people from different parts of both organizations). The Harris Corporation is a model example of a partnership that encompasses both of these qualities.

Harris Corporation's Support of the "Florida Plan"

The Harris Corporation is an excellent example of a Florida company that supports the "Florida Plan" through its partnership activities within its Space Coast community and around the State. As with many larger companies, Harris provides scholarship/ tuition/ reimbursement incentives for its workforce. Company personnel also routinely perform outreach cooperative activities associated with the Student Mentoring and Tours/Talks categories. There are also policies in place that address academic Funding/Access to Equipment project requests. However, two specific component of Harris' portfolio, *Adjunct Faculty/On-site Courses* and *Advisory Board/ Curriculum Develop*, are specifically important support for the ET degree as a model for the "Florida Plan". These two are highlighted below.

Adjunct Faculty/On-site Courses

Industry experts possess current, specialized knowledge and skills which make them invaluable assets as expert adjunct faculty members for many college technical programs. Students connect well with instructors who have hands-on, grass roots experience in their subject area. One bonus for adjunct faculty instructors is that they get to really know potential candidates for their own workforce during the extended period of the course. Holding classes on-site at an industry partner's manufacturing facility can also provide opportunities to expose students to the exciting world of manufacturing. Harris Corporation participates in this aspect of an industry education partnership in specific support of the ET degree and its MSSC-CPT certification pathway.

The heart of the ET degree implementation strategy and the reason for its acceptance is its inclusive curriculum reform with its built in college certificates as definitions of success and the bonus expectation that graduates will also hold Certified Production Technician (CPT) certificates. The ET degree model is an excellent no wasted time mechanism for students to become workers and workers to become students as dictated by their life style and career aspirations. This bi-directional transparency of the ET degree in combination with the MSSC credential expresses one of the degree program's major characteristics and is a key element in the "Florida Plan" model. Manufacturer acceptance of the MSSC-CPT is an important element for ET degree sustainability. Harris Corporation initiated a pilot project to have its product inspectors become CPT credentialed. Process engineers in the Training Department became a MSSC certified instructors and a CPT course of instruction was conducted after work at Harris. Six of the seven inspectors enrolled in this training received their CPT certification.

As an extension of this certification effort, Harris has become actively involved in the ET degree program at Brevard Community College. One motivation for this commitment is the fact that the CPT certification articulates 15 credits of the degree's 60 credit hour requirement. As designed, this articulation provides an incentive for Harris line personnel to pursue the degree. To date over 125 employees have enrolled in the ET degree program. These students attend classes at the local Brevard Community College campus after work. Although this student population does not take courses within a two year completion schedule, 64 student employees have graduated with the Applied Technology Specialist College Credit Certificate, 54 have graduated with the Engineering Technology Support Specialist College Credit Certificate, 31 have graduated with a BCC Composite Fabrication and Testing College Credit Certificate, and eight have graduated

with an Associate in Applied Science degree. Employees at Harris with A.S. degrees are alleageable for salaried career path opportunities that involve supervisory duties.

Harris' involvement in Brevard Community College ET degree is not just a benefit for employer and employee. The College has benefited as well. The steady enrolment of students from Harris helped establish the BCC program as a viable and important A.S. program. This has released additional internal BCC funding to support instruction. It has also resulted in the ET degree being offered at a second campus within the BCC system. In addition, the College has used the Harris partnership as a local model to bring other companies on board. A specific example is Embraer Corporation. This internationally known major supplier of regional and corporate jet aircraft has recently moved into the BCC service area and a partnership analog to the Harris partnership to help the company meet its expanding technician needs is well underway.

Advisory Board Participation/Curriculum Development Help

Every technical program should be driven by an active Industry Advisory Board. Industry's participation in advisory boards or committees helps with program design, implementation, and evaluation. Through these committees, industry partners, with their experience and expertise, help tailor curricula to current industry needs and infuse specialized skill sets beyond the traditional curriculum. Industry partners can request new topics connected to emerging technologies or more background practice in fundamental skills. Frequently, industry experts provide content material to educators who then develop lessons and learning activities. Industry would review this newly developed material before its use in the classroom. Harris serves on the Brevard's ET degree industry advisory committee and since it also provided instructors for that program, new and Harris related content is easily integrated into the ET program.

This review service has a specific and important role in the "Florida Plan". Evaluation is a critical component for sustainability of the Engineering Technology program and, as an essential phase of the "Florida Plan" for technical education, incorporates the FLDOE Adult and Career Education's policy that all Curriculum Frameworks are reviewed for rigor and relevance on a three year cycle. The review of Engineering Technology A.S. curriculum frameworks together with its supported technical college credit certificates began in 2012. FLATE is coordinating the Engineering Technology core frameworks review effort among the ET degree offering State and Community Colleges. Discussions among faculty across the state involved with the degree cover the current status of their program, expectations from their program advisory committee, and local quirks in program execution. The actual FLDOE appointed review committee is 8 to 12 members strong with at least half of that membership directly from industries affected by the degree program. Harris professionals are involved in both of these activities.

Finally, as a NSF-ATE Center of Excellence the National Science Foundation requires FLATE to have a National Visiting Committee (NVC). The NVC's duties include a direct and independent review of FLATE's performance. In addition, the NVC is designed to provide advice and guidance to the Center to facility the accomplishment of its mission. Harris is represented on FLATE's NVC together with senior representatives from other major manufacturers (Tropicana, Sun Hydraulics, Pratt Whitney, Hoerbiger) the FLDOE, and Workforce Florida. Thus, Harris Corporation is immersed in Florida's ET degree at all levels and committed to its community college's technician education efforts.

References

1. Florida Department of Education (2012). Florida Career and Professional Education Act (CAPE) Technical Assistance Paper. <http://www.fl DOE.org/workforce/pdf/CAPE-Act-TechAssist.pdf>.
2. Barger, M., Gilbert, R., Owens, E. (2012). *Aligning Florida's Manufacturing Programs with External Standards: Closing the Loops*. American Society of Engineering Education (ASEE) Conference Proceedings.
3. Barger, M; Gilbert, R., Roe, E. (2007). *Engineering Technology Reform in Florida*. ASEE Conference Proceedings
4. Barger, M; Gilbert, R; Roe, E; Jenkins, B. (2008). *Florida Engineering Technology Forum: A Vehicle for Change*. ASEE Conference Proceedings.

Bibliography

1. Hugh, Jack, ed. 2011. *Curricula 2015: A Four Year Strategic Plan for Manufacturing Education*. Society of Manufacturing Engineering, Manufacturing and Education Research Community.
2. U.S. Department of Commerce, Economics and Statistics Administration, May 2012. *The Benefits of Manufacturing Jobs*. ESA ISSUE Brief.
3. U.S. Department of Commerce, Economics and Statistics Administration, July 2012. *STEM: Good Jobs Now and for the Future*. ESA ISSUE Brief. www.esa.doc.gov/sites/default/files/reports/.../stemfinalyuly14_1.pdf. 8/ 1/ 2012.
4. American Association of Community Colleges 8/8/2011. *DOL Official Urges Credit for Short-term Training*. Community College Times, www.communitycollegetimes.com/. August 1,2012
5. Enterprise Florida, 2010. *The eflorida.com Knowledge Center*. <http://www.eflorida.com/>. August 28, 2012.
6. The White House. 2011a. *President Obama and Skills for America's Future Partners Announce Initiatives Critical to Improving Manufacturing Workforce*. The White House: Office of the Press Secretary. June 3, 2011.
7. The White House. 2011b. *President Obama Launches Advanced Manufacturing Partnership*. The White House: Office of the Press Secretary. June 24, 2011.