NATIONAL SCIENCE FOUNDATION

Directorate for Education and Human Resources (EHR)
Division of Undergraduate Education (DUE)

Advanced Technological Education (ATE)

Final Report For:
iTEC – The Information Technology Education Center in Florida

Originally Funded Under The Grant Proposal Titled:
Southeast Center for Networking and Information Technology Education

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Executive Summary

This report describes the final results of the NSF ATE DUE grant titled iTEC – The Information Technology Education Center in Florida. The grant was originally awarded under the title Southeast Center for Networking and Information Technology Education. iTEC (or the Center) was conceived as a regional initiative although it was funded as a national center prior to the creation of the ATE regional center program. From 2000 to 2007 iTEC promoted the development of curricula, processes, and infrastructure to improve programs and create a statewide delivery system to educate and train technicians to meet workforce shortages in the areas of computer networking and information technology. The Center has been composed of a statewide partnership of educational institutions led by two community colleges. iTEC partnerships also included several Florida K-12 school systems. Articulation models also supported student matriculation to Florida's state universities.

iTEC was designed to identify and develop best of breed IT workforce curricula suitable for an accredited educational institution, and to develop qualified faculty and support processes that facilitate course delivery. To this end industry certification curricula from Microsoft, Cisco, CompTIA, and CIW among others were incorporated into a "Teach The Teacher - T3" faculty resource and development center bringing together information technology instructional resources in an efficient delivery format. Over the course of the project 132 faculty workshops were held preparing faculty to teach 55 different information technology courses. Participating in these workshops were 1411 faculty from all 28 Florida Community Colleges as well as faculty from Mississippi, Virginia and Pennsylvania.

iTEC also included an Industry Education initiative that developed a business model and delivery mechanism for incumbent workers which leverages industry certification curricula delivered in a college credit format. The business model introduces an Account Executive sales model enabling colleges to build long-term strategic relationships with local businesses. Utilizing faculty and curricula developed by iTEC industry education account executives are offering customized corporate and continuing education training directly to local businesses. These educational programs meet specific immediate workforce needs, and also provide college credit degree career track opportunities for their employees. This model has been successfully institutionalized at Daytona Beach and Seminole Community Colleges. Hundreds of incumbent workers have received credit and non-credit education and training under this model. The model has also been disseminated state-wide in Florida through the Florida Continuing and Adult Education Standing Committee (CAESC) of the Florida Community College Council of Instructional Affairs.

iTEC also reached out to create awareness and facilitate entry into IT career tracks to young adults, minorities and women. Curricula and faculty developed by iTEC were incorporated into the Volusia/Flagler Advanced Technology Center (ATC). The ATC is

a partnership with two local school systems where eleventh and twelfth graders receive high school credit while dually enrolled in college credit classes sitting right along side adults. This program has been very successful, and iTEC was able to bring a female student to the annual ATE conference who actually received her Associate Degree in Computer Networking at the same time she received her high school diploma. She then matriculated to a state university in Florida entering as a Junior.

The remainder of this report describes the success of iTEC and its partners working together to achieve the following original goals of the project:

- Develop integrated networking and information technology curricula incorporating industry certifications
- Provide seamless K-16 articulation with multiple occupational exit points
- Provide in-service training and professional development for faculty
- Leverage industry partnerships to set requirements, create and validate curricula, and provide student and faculty internships
- Develop marketing programs that educational institutions and partnerships can use to recruit students with special emphasis on under represented populations

Activities and Findings

Activities Overview

The Information Technology Education Center in Florida (iTEC) is a regional facility focusing on the education of technicians in the field of information technology. The target audience for the Center includes faculty, students and incumbent workers. The scope encompasses curricula in all areas of information technology (IT). Initial work began with curricula that include competencies to develop workplace skills in all aspects of computer networking and the networking environment including both hardware, software and system technologies. Integrated into the multi-track curricula at appropriate levels of competency are early workforce exit points for appropriate entry-level occupations such as first level technical support representative and helpdesk technician. To a large extent this is made possible by following an industry standard certification curriculum path. Each year programs were added to cover other major areas of information technology. These included:

- Internet Services
- Computer Programming
- Database Administration
- Digital Media
- Computer Security

iTEC has taken a systemic approach to technician education that leverages Florida's world class system of twenty-eight community colleges. The primary methodology for curriculum development at the Center has been via adaptation and implementation of proven industry standard materials. These educational materials include NSF-funded national skills standards based curricula as well as materials developed by technology vendors and publishers leading to widely accepted industry certifications. Much of the early work built upon the success of skills standards identified by NSF ATE Grant DUE 9553727 and documented in the publication: Northwest Center for Emerging Technologies: BUILDING A FOUNDATION FOR TOMORROW- Skill Standards for Information Technology (1). The NWCET standards leverage earlier SCANS skill standards assessment initiatives (Secretary's Commission on Achieving Necessary Skills (SCANS) at the U.S. Department of Labor).

iTEC's success was accomplished by two world class community colleges working together to achieve a common goal. The Orlando metro facility is geographically located at Seminole Community College (SCC), and is the lead location for key industry relations in the rapidly expanding Orlando metropolitan region. SCC's leadership included both curriculum validation and industry education. The primary faculty development facility was located at Daytona Beach Community College (DBCC) approximately thirty miles northeast of Seminole Community College at the top of the Interstate-4 (I-4) high technology corridor. To better support the entire region iTEC also held faculty development events at Seminole CC, Valencia CC in Orlando, Brevard CC

near the Kennedy Space Center and Florida Community College at Jacksonville. Events were also held at St. Petersburg College and Miami-Dade College, which are two of Florida's community colleges now offering Bachelor degrees.

The innovations at iTEC focus less on the development of new materials and more on the integration of best-of-breed information technology educational resources in an accredited curricular framework. During the past decade commercial manufacturers and publishers have developed an abundance of independent technology education materials. Furthermore, many successful projects have developed innovative science, math and communications curricula for technicians using a charter school or learning communities approach. **A key challenge continues to be integrating these materials into pedagogically sound certificate and degree programs that transcend the parochial needs of specific product manufacturers to give students foundation skills for lifelong careers with simultaneous immediate employability. Another key challenge is developing and maintaining up-to-date qualified faculty that have an aptitude for the rigors of technology education along with a commitment to a career in teaching and learning**. This has been the charter for iTEC.

In addition to being the topic of the project, iTEC has also attempted to leverage the use of information technology as well as focusing on the integration of technology for the delivery of technician education. This means using multimedia resources, distance education and online/web-based curricula that incorporate a "virtual classroom" model. The approach used by the Center builds on past and current NSF ATE initiatives, particularly the DBCC Virtual Classroom Project which was praised for its accomplishments in its final review by a National Science Foundation visiting committee. Early on in the project iTEC established a web-based online registration system for the faculty development workshops. While this is standard practice at most colleges today, this was a new innovation for Florida colleges in 2000 and contributed greatly to the effectiveness, efficiency and ultimate success of the iTEC faculty development initiative. iTEC conducted a number of workshops online, and also ran workshops to help teach IT faculty how to utilize and develop online curricula.

iTEC's activities have been broad to succeed across five specific goals.

Activities for Each Project Goal

iTEC's activities have been guided by the following goals:

1. Develop integrated networking and information technology curricula incorporating industry certifications
2. Provide seamless K-16 articulation with multiple occupational exit points
3. Provide in-service training and professional development for faculty
4. Leverage industry partnerships to set requirements, create and validate curricula, and provide student and faculty internships

5. Develop marketing programs to recruit students with special emphasis on under-represented populations

A summary of the activities within each goal are listed below.

Develop integrated networking and information technology curricula incorporating industry certifications

- Curricula on 55 different IT topics were developed and delivered
- 390 industry certifications were awarded to IT faculty resulting from iTEC workshops

Provide seamless K-16 articulation with multiple occupational exit points

- Key foundation courses leading to multiple industry certification tracks such as CompTIA A+ and Network+ were adapted and coordinated with secondary school delivery, dual enrollment and postsecondary articulation
- IT programs at the colleges iTEC has served have been structured as both Associate of Applied Science with math and science foundation courses suitable for technicians, and also Associate of Science with pre-requisites suitable to articulate to four-year university Bachelor degrees
- iTEC supported programs have had students articulate Associate degrees to Bachelor degree programs at four-year universities such as Bachelor of Science in Information Technology at the University of Central Florida, and Bachelor of Applied Science at the University of South Florida

Provide in-service training and professional development for faculty

- iTEC established a world-class IT faculty development facility in Daytona Beach
- iTEC delivered workshops for 1411 faculty from all 28 Florida Community Colleges as well as faculty from Mississippi, Virginia and Pennsylvania
- iTEC also delivered IT workshops to Seminole and Volusia County school teachers
- iTEC's workshops focused on the critical skill areas of advanced information technology topics such as network operating systems and IT security

Leverage industry partnerships to validate curricula and provide student and faculty internships

- iTEC partnered with a number of industry leaders.
- The Florida High Tech Corridor Council led by three major universities and including industry representatives from 23 counties across Central Florida provided widespread industry partnerships
- Hundreds of incumbent workers received college credit training thanks to iTEC's industry education initiative
- iTEC's industry education initiative has been institutionalized at both SCC and DBCC
- Faculty were placed in summer internships with several industry partners

Develop marketing programs to recruit students with special emphasis on under-represented populations

- Information Technology program literature was developed in a bi-lingual Spanish format so that Hispanic/Latino students and their parents can more easily gain awareness of career opportunities in IT
- Resource materials were provided to the Women's Center to encourage pursuit of IT careers
- An IT Career video was produced that described and demonstrated opportunity to a diverse population

Supporting Florida's World Class Community College System

Florida, the nation's fourth largest state, is adding new residents at the rate of over 1000 daily, an influx that virtually guarantees that the state's workforce will continue to grow to supply the human resources needs of Florida's diverse industries.

Florida is a world leader in postsecondary education including a statewide system of twenty-eight community colleges. iTEC was able to leverage common course frameworks at both the secondary and postsecondary level. Florida's colleges articulate courses between schools with a statewide common course numbering system. Two-year degree to four-year degree articulation is facilitated with statewide common core course prerequisites for Associate to Bachelor degree articulation. By integrating rigorous industry standards based curricula into the programs, iTEC was able to facilitate the development of articulation high school academy courses to community colleges, and of AS and AAS graduates to Bachelor degree programs.

Adjustments for a Dynamic Industry and Central Florida Economy

iTEC is located in central Florida at the eastern end of what is often referred to as the Florida High Tech Corridor. At the time iTEC was initially funded studies showed that expanding businesses along this corridor introduce 1,500 new IT jobs per year.

The downturn in the economy in 2001 hit Central Florida along with the rest of the country. The very visible national reduction in demand for Information Technology workers affected this region as well. The dynamics of outsourcing and off-shoring had an affect. Furthermore, and most importantly according to the AEA, the oldest IT industry association in the country, the maturing of IT products which in turn improved the productivity of IT workers, all worked together to reduce the rate of growth in IT workforce needs.

The publicity and subsequent public perception of a reduced need for IT workers caused a dramatic decline in student interest and enrollment in IT courses. Most IT programs at community colleges are still at less than half of the enrollments compared to what they were in 2001. This in turn has reduced the demand for IT faculty.

In light of these economic trends it is all the more impressive that iTEC far exceeded the original goal and provided rigorous multi-day industry certification faculty development workshops to over 1,400 IT faculty over the course of the project.

Other Successful Initiatives And Partnerships

Microsoft/AACC Working Connections

iTEC partnered with Valencia Community College and Miami-Dade College to form the Florida Faculty Institute, and to host the Microsoft/AACC Working Connections program for three years.

Florida Business and Information Technology Consortium

iTEC partnered with all 28 Florida Community Colleges on the development of a website to support the Business and Information Technology Consortium. The consortium is a subcommittee of the Florida Continuing and Adult Education Standing Committee (CAESC). The website is used to share best practices by the Florida Community College Corporate and Continuing Education divisions in providing education and training solutions to business.

IT Summits

iTEC established and hosted statewide Summits for community college IT Program Managers, Department Chairpersons, Deans and Vice Presidents to discuss issues related to IT education. The Summits began in the third year of the project and were scheduled twice a year. There were over 250 people who participated in seven Summits. A major IT textbook publisher, Course Technology/Thomson Learning, was recruited to help sponsor the event and consequently the Summits will continue even after the completion of the iTEC project.

Center Evaluation

National Visiting Committee

Each year iTEC hosted an NSF national visiting committee. Committee members included both business leaders and NSF project directors with experience developing and managing NSF ATE projects. Some committee members served throughout the grant while others rotated off and were replaced. The complete list of members over the life of the project is:

Chairman: Dr. Charles Gould, President Florence-Darlington Technical College
Ms. Janie Schwark, Microsoft
Mr. Todd White, Cisco Systems
Dr. Jeff Bindell, AT&T/Agere Systems

Mr. Peter Safflund, NSF/ATE Northwest Center for Emerging Technology
Ms. Catherine Cotton, Jones County Junior College
Dr. Ashraf Saad, Georgia Institute of Technology
Mr. Henry Estrada, Evergreen Valley College
Mr. David Siefert, Sinclair Community College
Mr. Satish Mahajan, AAA

External Evaluation

Over the course of the project iTEC has had two external evaluators. For the first phase of the grant the evaluator was Dr. Jan Corbin. During her time as the iTEC evaluator Dr. Corbin also served as a Software Systems Engineer with NASA at the Kennedy Space Center.

The formative evaluations for the second phase of the grant as well as the summative evaluation were performed by Dr. Lea Witta, a research faculty member in the College of Education at the University of Central Florida.

The forty five page summative report is attached separately. The report gives a detailed analysis of each goal with the conclusion that all goals "have been met." The following quote is excerpted from the report.

> *"The iTEC program (or program staff) has not only met the original goals set for the project. The programs developed have been translated into community college programs – certificate programs – continuing education courses – and bachelor's degrees. This is a highly successful program."*

Dissemination

The dissemination activities included the following:

- The Center partnered with all twenty eight community colleges in Florida, created the IT Summits for Florida community college IT academic leaders, along with the Florida CAESC subcommittee of the Council of Instructional Affairs to insure dissemination within Florida.
- Papers and presentations were delivered at national events including the League for Innovations, American Association of Community Colleges and the NSF ATE Principal Investigators conference to highlight the activities of the Center, promote teacher/faculty training opportunities, and disseminate curricula, educational resources and marketing materials.
- The Center established a Web site, developed materials on CD-ROM, and published materials that were distributed state-wide and nationally.
- The Center regularly partnered with national publishers to make state-of-the-art resources available to community colleges and their IT faculty.
- Attribution to NSF was included in all iTEC activities and deliverables.

Partnerships

Collaborations That Focus On IT Workforce Development

The partnerships established for the Center were specifically designed to provide institutional strength and diversity with solid IT industry workforce representation.

iTEC partnered with all twenty eight community colleges in Florida. Several school systems were also served including Seminole, Volusia and Flagler County schools. Many meetings and articulation discussions were held with state universities including the University of Central Florida and the University of South Florida.

Industry partnerships were extensive and can be grouped into three categories. Members of the National Visiting Committee included industry partners such as Microsoft and Cisco. In addition, a second category of industry partners were involved in focus groups for ongoing needs assessments and DACUMS for curricula and courseware validation. A third extended category of industry partner includes those that provided student and faculty internships.

The primary source of industry partnerships grew out of the extensive support of the project by the Florida High Tech Corridor Council. The council includes over two hundred and fifty companies that are engaged in high-tech research projects with UCF, USF and the University of Florida.

Industry Education Initiative

A key initiative of iTEC was to leverage the project's academic curricula and faculty development activities in support of direct training and educational services to business and incumbent workers. By integrating recognized and valued industry certification curricula into college credit courses, the iTEC industry education initiative was able to merge academics with what have traditionally been separate workforce and continuing education offerings.

iTEC's development of an Industry Education Business Model was organized into three strategies of Joint Marketing, Account Management, and Solution delivery.

The joint marketing program is built upon branding the corporate and continuing education offerings of the college. The brand identifies and creates awareness within the business community that the college offers relevant and rigorous human performance improvement solutions that can help a company be more productive and profitable.

The Account Management strategy leverages a standard sales and service model from the private sector to establish strategic relationships between the college and local business. The account manager is able to become a partner with their client companies, become familiar with the unique needs of the business, and supports them with the entire resources of the college.

The delivery coordination strategy frees up the account manager from the routine functions of aligning resources, delivering solutions and evaluating outcomes associated with the educational goods and services rendered.

One distinguishing activity of this initiative was the incorporation of the Kirkpatrick Training Evaluation Model. While this model is over thirty years old, its use in the community college environment was a unique contribution of the project. The outcome of this Kirkpatrick evaluation initiative has been utilized to help employers realize the Return On Investment (ROI) of partnering with the community college for corporate and continuing education.

During the development and prototyping of the iTEC industry education model over a dozen companies and more the five hundred incumbent workers were served. These companies included Sprint, Siemens and Halifax Hospital. Subsequently this model has been institutionalized within Daytona Beach and Seminole Community Colleges. Many components of the model have also been adopted and/or adapted within the corporate and continuing education divisions at other Florida Community Colleges.

Findings Summary

iTEC has found that community colleges can successfully collaborate in curriculum alignment, faculty development, articulation and industry education. These collaborations offer efficiencies and benefits that would not otherwise have been possible.

Curriculum Alignment

iTEC demonstrated that colleges can improve the timeliness and relevance of their information technology programs by using best-of breed off-the-shelf curriculum resources driven by vendors and industry certification consortia. Furthermore, to the extent that relevant industry certifications are available and valued within a specific field, these certification competencies and curricula can be successfully integrated into college credit courses.

Faculty Development

iTEC found that curriculum alignment with widely recognized and valued industry certification creates a *point of consensus* around which colleges can collaborate on faculty development.

Based on delivery of industry certification workshops to over one thousand faculty, iTEC found that intense multi-day workshops are what faculty prefer. About half of the faculty prefer the workshops to be during the academic semester, and about half prefer they be offered in between semesters and during the summer. No single format will meet the needs of all faculty.

Faculty repeatedly told us they benefited from attending workshops that included other faculty. In addition to gaining the specific competencies associated with the subject matter, sessions of the workshops were able to focus on pedagogical issues involved in teaching the material. These include discussions of learning strategies, strategies for teaching particularly difficult concepts, laboratory exercises that work well in the classroom, and exercises that promote the development of soft skills such communication and teamwork.

iTEC's strategy to leverage IT workforce development resources by placing major emphasis on faculty development proved to give a high return on investment. There is a multiplying affect achieved by "educating the educators". A follow-up survey with a sample of 29 faculty performed by our external evaluator showed that their iTEC workshop experience directly impacted over 4103 students. When extrapolated to the hundreds of faculty participants in iTEC workshops we find that hundreds of thousands of students have benefited over the life of the seven year program.

iTEC also found that distance learning delivery models suffer the same retention issues for faculty development as they do with typical college courses. While some minor success was achieved with some workshops that contained hybrid distance learning and traditional lecture delivery, much more work needs to be done in this area.

The iTEC faculty internship program was attempted for the first three years, but was never very successful. Varying approaches utilizing iTEC staff, contracted faculty and outside consultants were attempted. Locating suitable faculty intern sites was difficult. Recruiting faculty to participate in the program was challenging. Matching intern sites with recruited faculty proved to be almost impossible. Less than a dozen faculty internships were accomplished during the project.

Student Articulation and Diversity

Articulation was greatly facilitated by integrating widely recognized industry certification into the college credit curricula. This included articulation from high school career academy programs to community colleges, as well as articulation to baccalaureate programs at the university level.

iTEC also had some success in developing recruitment and marketing collateral that promoted information technology careers to a diverse population. These included template brochures that were written in English on one side and Spanish on the other. This facilitated students and parents both being able to read the material and discuss the opportunities. iTEC also developed a video describing information technology careers and programs that highlighted women and minority IT workers.

An iTEC study which followed graduates from some of the information technology programs it served showed outstanding student success. Forty five individuals who received instruction from faculty who attended iTEC workshops were contacted one year after graduation. One hundred percent of them were employed at thirty different employers. Most of them were employed at a salary range of thirty to forty thousand dollars a year, with ten percent of them in the forty to fifty thousand dollar range. The total of annual salaries of all forty five individuals was over one point five million dollars ($1,500,000.). This direct correlation between investment in education and subsequent economic prosperity is another indication of the value of community colleges, and the high return on investment of NSF Advanced Technological Education programs.

Industry Education

iTEC found that integrating broadly recognized industry certifications into college credit curricula positions a college to better serve the corporate and continuing education needs of the local business community. Specific examples of these are the delivery of computer support technician training using the CompTIA A+ and Net+ curricula. Another example is in the area of IT project management with curricula leading to the PMP certification.

Furthermore, iTEC found that leveraging the Kirkpatrick training evaluation model can lead to some quantification of the return on investment of industry education. We also found that while simple in concept, the application of this model is time and labor intensive, and requires a major commitment on the part of the employer. iTEC's findings indicate that much more work should be done in this area as a way for community colleges to quantify their economic impact and value to their business community.

Unexpected Findings

The iTEC grant was funded in 2000, but was developed and written in 1998 and 1999. The information technology industry has changed dramatically between then and when the grant completed in 2007.

The IT industry workforce requirements have changed dramatically. Major IT layoffs and workforce reductions occurred in 2001. There has been much study and speculation as to why this occurred. The reasons stated have included:

- There was an unusual buildup of need in the late 1990s to deal with the infamous "Y2K" threat leading to subsequent lay-offs
- The downturn in the economy reduced the need for IT workers
- Many companies began outsourcing IT which achieved certain economies of scale and efficiency
- The development of the Internet began a globalization movement which allows many IT functions to be off-shored
- The maturation of IT technologies and products increased the traditional IT worker's productivity enabling fewer IT workers to meet a growing demand
- The maturation of IT technologies and products allowed non-IT workers to use IT intensive tools with minimal need for professional IT support

There are plenty of anecdotal examples for each of these reasons. The iTEC leadership believes that all of these situations contributed to the evolving needs of IT workforce development and education.

The reality is that IT workforce demands continue to grow, but at a slower pace and in new ways that have not been fully recognized. Two particular trends that merit further study are the integration of IT into other business disciplines, and the accelerating dynamics of the IT technician workforce.

Ten years ago information technology was so difficult to use that it required specialized training just to take the technology out of the box and make it work. With today's more mature products, just getting the technology to work is not that difficult. Today's businesses need technical workers that are more skilled in the application of the technology to their specific industry. The digital media industry can serve as an example. Visual arts and graphics design have become information technology intensive. Successful professionals in these industries are actually proficient information technologists, but they are seldom categorized as such. This trend is propagating less dramatically in other industries. Whether it is the health care industry, financial services, manufacturing or modeling and simulation – information technology specialists are needed that are also skilled in the concepts, terminologies and processes specific to that industry. The "IT generalist" is becoming less valuable in these sectors. More IT curricula and programs need to be developed that produce IT specialists for these industries.

The other trend that is something like "the elephant in the room" that no one wants to mention is the challenge for IT technician education in America. While off-shoring has been exaggerated with regard to its impact to the overall IT workforce – it has had a major impact on technician jobs. The IT helpdesk was one of the primary entry level technician jobs that two-year college graduates could count on to use as a pathway to enter the workforce. These jobs are now effectively performed at reduced costs by workers in other parts of the world with graduate computer science and engineering degrees. Simple application programming for data entry, customer and inventory databases and financial reporting were also prime entry level jobs for IT technicians.

These functions can now be performed by non-IT professionals using intuitive graphical tools that can be mastered with a few days of training.

There is severe need for studies and research to develop strategies and processes to keep up with the rapidly changing needs of IT technician education. A streamlined pipeline that is constantly tracking the changing needs of global IT vendors and users must drive the process. A continuously validated repository of IT skills and competencies needs to be dynamically configurable into customizable curricula, skills assessment and industry standard certification instruments. The complexity of this task due to the diversity and breadth of the stakeholders, the high expense with the value being widely dispersed, along with the rapid pace of change of the requirements have contributed to the illusiveness of any solution to date.

It should be noted that the iTEC team developed a proposal for an NSF ATE National Center that would tackle this problem. Unfortunately, the reviewers were not impressed with the proposal and felt that it was more appropriate as a workforce development project funded by some other agency such as the Department Of Labor.

(end of report)