A Synergy of Internships, Research, Scholarships, and ATE Centers

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Abstract

With the advent of the information superhighway, the Telecommunications Deregulation Act of 1996, and recent advances in technology, the telecommunications industry over the past five years has undergone unprecedented growth with even greater technological breakthroughs predicted for the upcoming decade. Along with this growth comes the challenge of educating enough individuals in the field of telecommunications to assist the industry in maintaining a competitive edge in the global marketplace and to train capable workforce for the years to come. The effort to train the trainers and offer technology career awareness to students is key to making this happen. The cooperation of industry, government, and education facilitates this workforce synergy.

I. Introduction

The Northeast Center for Telecommunications Technologies is located on the campus of Springfield Technical Community College in their Technology Park. Other educational partners are located at exceptional institutions throughout the Northeast and the Center’s Business and Industry partners number in excess of 36 companies. The educational and industrial collaborators together are addressing the need of business/industry for educated technologies by designing, developing and implementing a new infrastructure for telecommunications technology education, one which can be replicated regionally and nationally. The Center is a catalyst for building an educational framework in New England and New York, with eventual transfer to the Nation, to meet the growing demand for highly skilled technicians and engineers in rapidly changing and emerging telecommunications fields.

To that end, the Northeast Center has formed a regional network of secondary and post-secondary educational institutions (2-year and 4-year), leading edge telecommunications corporations, government and private agencies to:

1. monitor emerging telecommunications-related technical trends, applications and innovations;
2. develop relevant curricula and materials to support advanced technical education of the current and future workforce of telecommunications-related industries;
3. become a location for internships with industry, in order to "earn while you learn", and to develop a center for idea gestation for industry and government related projects;
4. explore and promote best educational methods and tools for delivering world class technical education and related math and science disciplines in cost-effective ways to diverse populations of learners to ensure national workforce development; and
5. ensure the continuing technical competency of faculties who teach telecommunications-related programs in the Northeast and nationally.

Other educational partners are located at exceptional institutions throughout the Northeast and the Center’s Business and Industry partners are listed at the end of this summary. The educational and industrial collaborators together is addressing the needs of business and industry for an educated workforce in telecommunications technologies by designing, developing, and implementing a new infrastructure for telecommunications technology education, one which can be replicated regionally and nationally. The Center is becoming a catalyst for building an educational framework in New England and New York, with eventual transfer to the Nation, to meet the growing demand for highly skilled technicians and engineers in rapidly changing and emerging telecommunications fields.

Baseline data on the current capability of colleges in the Northeast to meet the growing needs of telecommunications-related industries show that very few AS/AAS technicians or BSET engineers were graduated with a telecommunication specialization from colleges in the Northeast in 1996. New projects in telecommunications education funded by Bell Atlantic and by the NSF, with STCC in the leadership role in both, were launched in 1996 and have begun the process of telecommunications curriculum development at selected colleges in New England. The Northeast Center is building upon these activities, and, over a six-year period, will support "ramping up" programs, courses and educational activities at secondary and post-secondary institutions and telecommunications firms to address the expanding personnel needs of the industry.

II. Objectives

The program is working toward the following objectives to:

1. Develop a new competency-based, industry-driven, seamless curriculum beginning in grade 11, through the Associate Degree and, culminating in the Bachelor of Science in Engineering Technology (BSET) or Bachelor of Science in Engineering (BSE) focused in Telecommunications with additional gateways to baccalaureate programs and beyond;
2. Write, pilot test, and publish curriculum materials CD-ROM, Video, Multi-Media, etc.) to improve telecommunications technology instruction and the underlying math and science principles which support it;
3. Develop alternative and state-of-the-art instructional delivery mechanisms (virtual laboratories, telepresence, synchronous and asynchronous learning, Internet courses, etc.);
4. Disseminate the curriculum, curriculum materials, and model program regionally and nationally; and
5. Inform, attract and recruit qualified high school students, including populations of women and minorities, with an emphasis on supporting the development of critical prerequisite skills in math, science, and technology. Internships in the various partner industries and institutions will further reinforce the industry-driven thrust of the Center.

The Center is developing curriculum and telecommunications technologies in three areas: Networking, Wireless/RF, and Lightwave.
III. Overview of Activities

The activities for the Northeast Center for Telecommunications Technologies (NCTT) have been numerous, and steady progress has been made in the areas curriculum development, skills/competencies incorporation, dissemination, industry cooperation, internships, and community/school outreach. NCTT has received strong support from faculty, students, industry, and the seven states represented by the Center. This support has been due, in large part, to the efforts and talent of the NCTT team of principal investigators, the staff, and the key personnel involved.

The program has been strongly supported by matching and in-kind contributions from our education and industry partners and from STCC. These activities include: infrastructure establishment, workforce development, scholarships, equipment donations, release of personnel to NCTT activities, co-production of materials and co-sponsorship of activities such as conferences and career awareness. The total matching and in-kind funds projected in the original proposal through the end of year 3 (March 2000) was $2,141,095. The actual matching and in-kind funds for the period September 1997 through February 2000 was $3,945,722.

Figure 1. Example of Donated Equipment

To date, the principal activities of the Center have been to:

1) Meet with the National Advisory Board (National Visiting Committee), an assembly of experts in curriculum, administration, and industry;

2) Continue the high school technician program and the A.S. Telecommunications degree:
   a) The technician training program was initiated at the secondary level at the lead school, Minuteman Technical Vocational High School, Lexington, MA in September, 1997 and continued this period, with dissemination to the partner high schools.
   b) The A.S degree program was piloted at Springfield Technical Community College, Springfield, MA in September, 1997 and continued during this period, with dissemination to the partner 2-year schools.

3) Continued curriculum, industry, and faculty development with partner schools:
   a) 12 secondary, 12 two-year, and 4 four-year institutions.
b) It should be noted that NCTT has also included former FOTEP and Telecom (previous STCC/NSF grants) schools as associates at no cost. These associates do not receive the stipends that partner schools do, but are allowed to attend without registration fees.

4) Continue implementation of gender equity and cultural issue awareness for the programs;
   a) Workshops have been held with guidance counselors in both the New England and New York area.
   b) The Western Massachusetts Area Gender Equity Project personnel presented a workshop to partner participants in the week-long NCTT June workshop.
   c) New England and New York partners are utilizing the New York City Technical College Program to increase career, gender, and cultural awareness in the communities and in the secondary schools.

5) Establish the laboratories within the facility;
   a) Two demonstration laboratories were built and upgraded in the NCTT facility, and multiple experiments and demonstrations in elementary and advanced telecommunications techniques, meant for a wide range of audiences, have been developed with support from Bell Atlantic, JDS Uniphase, Nortel Networks, Sandia National Laboratories, Cisco Networks, Springfield Technical Community College, and other NCTT partners.
   b) The laboratories have been equipped with state of the art instrumentation for laboratory development and demonstration test in the areas of lightwave, networking, and wireless.

6) Develop and hold workshops (involving industrial partners and the Massachusetts Telecom Council, MTC) for the partner and associate schools for both teachers and guidance counselors.
   a) A new Teachers of Technology (TOT) workshop was held January 19, 1999.
   b) A two-day workshop on Technology Transfer for teachers and guidance counselors was held on April 8-9, 1999. Industrial partners were also in attendance for presentations. Over 300 attendees were present. Nationally recognized leaders from government, industry, and education spoke on topics germane to futuring in the telecommunications arena. See Figure 2.
   c) Intensive workshops on telecom technology and curriculum development were held in the Summers of 1998, 1999, 2000 for all partner and associate schools and industrial partners. See Figure 3.
   d) Four regional workshops were held in representative areas of the region each year during the Fall.

Figure 2. Dr. Karen Mayo at April 8-9, 1999 Tech Transfer Workshop

Figure 3. Dr. Karen Mayo at April 8-9, 1999 Tech Transfer Workshop
7) Continue the systematic development of skills standards for the telecommunications technician.
   a) From data, interviews, industry questionnaires, and previous projects (NSF FOTEP and Telecom), skills standards/competencies for both secondary and two-year college programs have been written. These served as a foundation for the Fall 1999 academic course offerings in the programs.
   b) The core competencies for the generic telecom technician have been written.
   c) A shell for the development, from these competencies, of all areas of the curricula (lightwave, wireless, and networking) has been developed, and individual option competencies are being written.

8) Develop and maintain web and CD delivered courses and online media resources through our website.
   a) The resource library is being built with diversity, gender, career, software, and telecom related entries.
   b) Over 300 tutorials in telecommunications have been made available on the website. A set of hyper-links is provided via website access (http://www.nctt.org/).
   c) Through the website, NCTT has developed distance media course offerings in telecom.
      To further these goals, NCTT obtained a $122,000 grant from the MA Dept. of Ed. For distance learning.

9) Develop regional networks.
   a) A network of schools and industry partners has been formed. Extension of this network to a national base has begun with six additional schools.
   b) A sub-network of shadow secondary schools with colleges is in place.

10) Develop a business plan for sustainability and ongoing evaluation plan based on realistic goals.
    a) A business plan for sustainability has been developed with industry education and training.
    b) The Interim, Second Year Evaluation Plan and Yearly Evaluation are being used as guides for tracking the Center’s progress toward its planned goals and objectives.

11) A video, which gives an “Introduction to NCTT”, has been produced by Springfield Technical Community College personnel, along with a video/CD on “Careers in Telecommunications”. Sixteen courses of the telecommunications technology, as part of the ASET/BSET curricula, have been completed.

12) The NEBHE issues the Northeast Center for Telecommunications Technologies newsletter, NCCT News, since November 1997. Since this time, five other issues of NCTT News and the first three issues of “Telecom Tech Update”, a technical newsletter concentrating on the salient features of telecommunications, with a primer on the central topics of the Update.
(Lightwave, Networking, and Wireless), have been published. The newsletters are mailed to more than 3,000 high school and college instructors and administrators, industry leaders, and both government executives and congressional representatives throughout the northeast and the nation.

13) The website at http://www.nctt.org has been continually updated and appears to be very well received by its readers viewing industrial site referrals, information on the Center, listing of the Principals and National Advisory Board, updates on workforce, technology, news, newsletters, tutorials, glossary, newsletters, tech updates, women’s issues, ethics, and curricula.

14) Twelve paid, summer interns (2 high school, 8 post secondary two-year, and 2 four-year institutions) were hired at NCTT for the summer of 1999 and 2000. These students worked at the NCTT facility in Springfield. There were six interns carried over for the academic year as well. As a result of this experience, five of our interns were offered jobs at telecom companies in Florida, Connecticut, and Massachusetts. Information gathered from this experience has helped the program in the future experiences for both the fall and spring semesters. In addition, two teachers participated in this summer program both at the Center and in industry. These intern programs are extended to the other schools and industries in the regions in the first semester of this year (Fall, 2000). The internships involve tasks from curriculum and data gathering to laboratory development and working for industrial partners on varied areas of telecommunications technology. See Figure 4.

Figure 4. Fiber Optic Intern

15) Progress in the area of instructional technology development is strong. The effort concentrated on electronic courseware development, media courseware, web authoring, and virtual/remote laboratory development. Virtual laboratories in electronics, digital electronics, and telecommunications laboratories have been piloted during this year. By using National Instruments and Hewlett Packard software along with Electronics Workbench software for simulation, integrated with some laboratory equipment, virtual (computer generated) laboratory experiences have proven to be a great help in allowing students to access sophisticated equipment without the need for purchasing high-dollar items. The laboratories developed to date were demonstrated at the summer 1998 workshop, in Miami (League for Innovation) in the fall of 1998, spring and summer of 1999, summer of 2000, and for potential publishers.
IV. Industry Assessment

The curriculum and the program are being assessed from two points of view. First, the evaluation questionnaires provide the NCTT with a basis for establishing a primary thrust in the curriculum and preferred skills set for a viable workforce. Second, the industry has evaluated the output of the program by means of internships, for both teacher and student. This active feedback helps the faculty and partner school participants to redesign, revise, enhance, and innovate according to industrial perceptions.

The close relationship of the Massachusetts Telecom Council with NCTT allows for the Center to obtain rapid assessment of the programs by over 300 companies in the telecommunications industry. Data and workforce information are readily interchanged, providing a mutual synergistic working relationship. A cadre of consultants and speakers is available with a one communication, and critiques of curricula, laboratories, and delivery modalities is in process.

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Biographical

James V. Masi is executive director for NCTT. He has worked in the private sector in varied areas of physics and materials science. He was professor and department chair of electrical engineering and bioengineering at Western New England College and is presently Professor Emeritus. He holds over sixty patents, has authored numerous articles and papers, published three books and lectures extensively. Masi holds the B.S. in physics from Fairfield University, the M.S. in physics from Long Island University, and the Ph.D. in Applied Sciences from the University of Delaware.

Nicholas Massa is associate director for NCTT where he is responsible for curriculum development and coordination. He has been professor and program director for the laser/electro-optics technology department at STCC since 1986. He has more than 15 years’ experience in the field of photonics and is an active consultant to that industry. Massa has received numerous grants and awards for the development of curriculum and laboratories in the field of photonics, including the NSF/ATE Fiber Optics Technology Education Project and the NSF/ATE Machine Tool Advanced Skills Technology Education Project. He holds a bachelor of science and a master of science in electrical engineering from Western New England College.

Gary J. Mullett, associate director for NCTT, is professor of electronics technology at STCC. At NCTT, he is responsible for overseeing curriculum development initiatives in the area of wireless telecommunications and virtual laboratories. He has extensive consulting experience with the minicomputer and microwave/mm-wave manufacturing industries and RF/wireless communications industry. Mullett was principal investigator of an NSF/ATE project on Telecommunications and Networking and is the recipient of an NSF grant to develop a wireless telecommunications laboratory. He also serves as electronics curriculum coordinator for the Bell Atlantic Next Step program. He holds a bachelor of science and a master of science in electrical engineering from University of Massachusetts Amherst.

Gordon F. Snyder, Jr. is associate director for NCTT, where he serves as project director the Microsoft Connections grant program and manages curriculum development for networking. He has taught in the telecommunications, electronics systems, computer systems and laser electro-optics departments at STCC since 1984, and co-chaired those departments from 1990–1999. He helped develop the Bell Atlantic Next Step program and now serves as telecommunications curriculum coordinator for the Bell Atlantic Next Step program. He was an
adjunct instructor in the bioengineering department at Western New England College and is the author of two engineering textbooks. He has extensive consulting experience in the field of communications and LAN/WAN design. Snyder received dual bachelor of science degrees in microbiology and medical technology from University of Massachusetts Amherst, and the master of science in electrical engineering from Western New England College.

Fenna Hanes is associate director for NCTT, and director of the New England Technology Education Partnership (NETEP) at the New England Board of Higher Education (NEBHE). Under her direction, NEBHE is responsible for research and dissemination for the Center. Prior to joining NEBHE, Hanes was director of marketing and communications for the Bay State Skills Corporation, a Massachusetts quasi-public corporation. She is the author of three emerging industry publications. Hanes holds a bachelor of science degree from Northeastern University and a master of science in public affairs from the McCormack Institute at the University of Massachusetts Boston.