# Connecticut College of Technology

Dr. Karen Wosczyna-Birch

Connecticut's College of Technology

Connecticut's Community Colleges,


Dr. Marty Woods

Assistant Dean

School of Engineering

University of Connecticut


Dr. Ron Adrezin

Professor

School of Engineering

University of Hartford

Connecticut College of Technology

The Connecticut Community College System (CCCS) comprises twelve (12) two-year public institutions throughout the state. With a total enrollment of approximately 55,000 students, the CCCS is an entry point to higher education for many of the state's economically disadvantaged and students from historically underserved and underrepresented groups. The Community College System continues to enroll 60 percent of all students enrolled in public institutions of higher education in the state.

The system-wide "College of Technology"-a virtual college that provides a framework for high-quality engineering and engineering education and is offered throughout the 12 state community colleges-was implemented in 1995 and currently has over 600 students enrolled in the Community College COT programs. The College of Technology (COT) offers a two-year curriculum that prepares students for the workforce and concurrently is transferable to a B.S. degree. There are two "pathways" in the College of Technology, an A.S. degree in Technology Studies and an A.S. degree in *Engineering Science.* This streamlined engineering and technology program-unique to New England and many other states- articulates with Central Connecticut State University's School of Technology, and the schools of Engineering at the University of Connecticut, the University of New Haven, the University of Hartford and Fairfield

University.  In 2001, a system to system COT articulation agreement for the College of Technology was signed with the 17 regional vocational-technical high schools.  In 2003, a partnership was established with greater Hartford secondary schools for a pre-engineering program called Project Lead the Way (PLTW).  In the PLTW consortium, students will complete their capstone project and one senior level course at a neighboring community college.

The implementation of a seamless pathway program in Engineering and Engineering Technology was first piloted with the Engineering Department at the University of Connecticut and with the School of Technology at Central Connecticut State University.  This paper will highlight the strategies that were used to overcome articulation and transfer barriers between two-year community colleges and four-year engineering programs including the following:

1 Organizational Structure

2 Administrative procedures

3 Articulation using program outcomes

4 Mentoring

5 Scholarships

6 National Science Foundation grants

7 Outreach programs

8 Gender equity and diversity activities

*Organizational Structure*

The College of Technology has a State Director/Coordinator who serves as the liaison between the twelve community colleges, the partner four year institutions and the

Department of Higher Education. The State Director/coordinator is an engineering/technology faculty member who is reassigned half-time from her faculty responsibilities in order to perform the administrative duties of the College of Technology.

Each of the participating colleges and universities have a site coordinator who is responsible for the coordination of the College of Technology program on their campus. Their responsibilities include scheduling courses, attending monthly COT site coordinators meetings, organizing campus activities, recruitment of students and counseling and advising COT students. For the two year colleges, the site coordinators are all full-time faculty members in engineering or technology while for the four year institutions, the site coordinators are Deans in either the Engineering or Technology Schools.

*College of Technology Site Coordinators Council*

The College of Technology Site Coordinators Council is composed of the Site Coordinators from each of the participating colleges and universities along with the State Director/Coordinator. The meetings are convened monthly during the academic year and are facilitated by the COT State Director. Administrative and curriculum issues are discussed at the COT Site Coordinator Council meetings and often, COT policy is developed and implemented.

At least two of the COT Site Coordinators Council meetings are expanded into statewide meetings where administrators, support faculty and student counselors convene to review how the COT is operating and to update all of the participants on any changes in the COT curriculum or transfer protocol. In addition, faculty to faculty dialogues are also held for not only the COT site coordinators but include faculty who teach in the math and sciences. These faculty dialogues have been instrumental in ensuring that communication

between the two year and four year faculty members is ongoing and addresses any potential issues before they become a major problem for the two year community college student.

*College of Technology Advisory Council*

The College of Technology Advisory Council is composed of decision makers from all of the participating institutions along with representatives from the Department of Higher Education, the Department of Education, the Chancellor's Office of the Community-Technical Colleges and from business and industry. This Council is a policy making entity that was initially very instrumental in ensuring that the College of Technology was successfully implemented at the participating institutions. Presently, many of the administrative decisions that used to be decided by the COT Advisory Council have now been delegated to the College of Technology Site Coordinators Council.

*Administrative Procedures*:

The College of Technology Administrative Procedures were originally established by the COT Advisory Council. However, over the years, administrative decisions and procedures have been discussed and agreed to by the Site Coordinators. The COT State Director facilitates all of the COT Site Coordinators Meetings, and also is instrumental in working directly with the Deans of the Engineering and Technology Schools at the four year institutions. If a particular administrative issue cannot be resolved, then it is brought to the COT Advisory Council for resolution.

*Articulation*

Initially, the two pathway programs were articulated with the four year institutions using a course by course review. This entailed an enormous amount of paperwork and

human resources.  In addition, the University of CT required that the engineering science courses for each of the 12 community colleges be reviewed individually and on an annual basis.  It became readily apparent that this mechanism for establishing a seamless pathway in Engineering between the 12  community colleges in the community-technical college system and the engineering program at the University of Connecticut was labor intensive and not abiding by the spirit of the legislation that created the College of Technology.  In addition, ABET 2000 advocated the use of program outcomes for the determination of course equivalencies.  With the support of ABET and the Deans and faculty of the participating institutions, the articulation protocol  for the Engineering Pathway program between the University of CT and the 12 community-technical colleges  was restructured using course outcomes and not course by course evaluations.  This articulation protocol has been used for subsequent articulation agreements with the private Schools of Engineering at the four year institutions.  In particular, the use of program outcomes has been instrumental in maximizing the number of community-technical college credits that students can apply towards their four year engineering degree and in ensuring that the engineering pathway is as seamless as possible.

For programs that may not follow a calculus based curriculum, bridge courses were also developed that allow students to take one-two courses that bridge the gap between an algebra-based and a calculus based program of study.

*Mentoring*

As in any program, student success is often dependent on faculty advising and mentoring.  It was also discovered that it was very helpful to connect the community college student with the four year site coordinator while the student was still enrolled at

the two year institution. In order to assist with the transition between the two year and four year institutions, a variety of student activities were planned where students and faculty from both the two year and four year colleges participated. These activities included student/faculty picnics; industry/student workshops on teambuilding and career opportunities; a statewide honor society induction for engineering and technology students; and seminars/luncheons that included workshops that focused on student retention and achievement.

*Scholarships*

Both the College of Technology and the University of CT have National Science Foundation Computer Science, Engineering and Math (CSEMS) Scholarship grants. These scholarships have been instrumental in recruiting a diverse population of students to careers in engineering and computer science. In addition, the CSEMS scholars are given priority for the receipt of the CSEMS scholarship dollars when continuing their education at the University of CT. The CSEMS program also has a strong mentoring and counseling component for its recipients that assists the community college student with the culture differences and administrative protocol that distinguish community colleges from four year institutions.

In addition, several of the four institutions have scholarship dollars that are earmarked for College of Technology students who continue their education at the four year college/university's School of Engineering programs.

*National Science Foundation Grants*

The CT College of Technology has received several National Science foundation grants including two Advanced Technology Grants and a four-year CSEMS scholarship grant

discussed previously, which targets students who major in computer science, engineering or math. The successes and challenges of these grants have contributed immensely to the growth of the College of Technology. The NSF ATE grants have assisted with the development of a new Integrator Technician program which includes courses in cabling, networking and computer technician training. In addition, the ATE grants have supported new courses and curriculum development in telecommunications, photonics, laser safety, fiver optics, manufacturing, plastics and composites. Finally, the ATE grants have supported faculty externships in cutting edge industries that have been used for integrating industry applications into the classroom and laboratories.

*NASA Space Grant*

The College of Technology is also a member of the CT NASA Space Grant Consortium. Through this initiative, the COT students at the community colleges have the opportunity to participate in a number of career awareness programs offered throughout the year. In addition, ten $500 scholarships are awarded to College of Technology students who plan on continuing their education at a four year institution in engineering, science or technology.

*Outreach Programs*

The College of Technology has been involved in a number of outreach programs that have been co-sponsored by the community college and the four year member institutions. In particular, the COT has partnered with the CT Pre-Engineering Program (CPEP) to assist with an after school and Saturday program that targets middle and secondary school children from CT priority school districts. With the CT Department of Transportation, the COT and CPEP are also involved in the delivery of the national TRAC

program that offers workshops and programs that target careers in transportation.

*Gender Equity and Diversity Activities*

The College of Technology site coordinators and the member institutions are committed to increasing the enrollment of under represented populations in engineering and technology disciplines. As a result, numerous gender equity workshops have been held at the member institutions. In addition, the COT has been involved with the NSF funded MentorNet and has also established its own network of faculty and industry mentors for the COT students. The COT has been the recipient of several gender equity grants for increasing the awareness of career opportunities in engineering and technology for middle and secondary school students and their teachers.

*Summary*

The CT College of Technology has established a successful seamless pathway between the State of Connecticut two-year institutions and public and private four year colleges and universities in engineering and technology. The initiative has provided the engineering and technology community with an opportunity to learn from both the successes and challenges of implementing a seamless program between community colleges and four year colleges/universities that minimizes the barriers that two year college students often face when they continue their education at a four year institution. As a result, initiatives like the College of Technology have the potential to maximize the success and retention of the community college student who continues their education in engineering and technology at four year institutions and in the process contribute to a greater number and a more diverse population of future engineers.

**REFERENCES**

Allen, Sue, 1997. Using scientific inquiry activities in exhibit explanations. *Science Education* v. 81 p. 715-34.

Burgio, Patti, 2000. Improving technological literacy. *Mechanical Engineering* v. 122 no5 p. 32.

Consortium for Policy Research in Education, 1995. Reforming Science, mathematics, and technology education; NSF Systemic Initiatives, CPRE Policy Brief. New Brunswick, NJ: Rutgers University, Author.

Dori, Yehudit J., Tal, Revital T., 2000. Formal and informal collaborative projects: engaging in industry with environmental awareness. *Science Education* v. 84 no1 p. 95-113.

Edwards, Cliff, 2000. Scientist works to give women a voice in the cyberworld. *Black Issues in Higher Education* v.17 no5 p. 64.

Geppert, Linda, 1995. The uphill struggle: no rose garden for women in engineering. *IEEE Spectrum* v. 32 p. 40-50.

Gordon, Edmund W., 1988. Educating more minority engineers. *Technology Review* p. 68-73.

Hanlon, Mark, 1995. Helping inner-city students discover engineering. *Civil Engineering* (Am. Society of Civil Engineers) v. 65 p. 6.

Johnson, (Ed.), 1997. Minorities and Girls in School: Effects on Achievement and Performance. Thousand Oaks, CA: Sage Publications, Inc.

Mino, Michael A., 1995. A Futuristic Vision, Technology for All Americans. *Technology Teacher Journal*, 55(4).

Ramey-Gassert, Linda, 1996. Same place, different experiences: exploring the influence of gender on students' science museum experiences. International Journal of Science Education v. 18 p. 903-12.

Schulz, William, 2000. High-tech workforce needs women, minorities. *Chemical & Engineering News* no.30 p.10.

Shetty, D. et al. 2001. *Integrating Engineering Design with Humanities and Social Sciences and Mathematics*. Presented at the ASEE National Conference, Albuquerque, New Mexico.

Sims, Calvin, 1992. From inner-city L.A. to Yale engineering. Science v. 258 p. 1232.

Simkins, Michael B., 2000. Partnerships that work. *Technology & Learning* v. 20 no7 p.

40-2, 44-5.

Vetter, Betty M, 1992. Changing demographics and shrinking engineering enrollments. *Journal of Petroleum Technology* v. 44 p. 360-4.

Welch, M., & Sheridan, S.M., 1995. *Educational partnerships: Serving students at risk*. Ft. Worth, TX: Harcourt Brace.