

Abstract

Stephen J. Fonash

The Pennsylvania Nanofabrication Manufacturing Technology (NMT) Partnership is a regional National Science Foundation (NSF) Advanced Technology Education (ATE) Center which provides a broad micro- and nano-scale fabrication, synthesis, and characterization education experience for two-year degree technology students. Graduates of its programs earn their two-year degrees from 21 different institutions from across Pennsylvania. The key—and unique aspect—of the program is its “capstone semester” which is integral to the curricula of the 33 different associate degrees granted by the Partner institutions. The capstone semester is a hands-on experience in nanotechnology manufacturing provided by Penn State three times per year at its University Park campus as a service to the two-year-degree granting schools. Originally the degrees granted focused on micro- and nano-scale manufacturing for the semiconductor industry. Since 2000, the curricula stress very broad training in micro- and nano-scale fabrication, synthesis, and characterization to insure life-long career flexibility for graduates and a versatile workforce for industry. The capstone semester is now used in two-year degree programs in fields as varied as chemistry, manufacturing, and biotechnology. With the addition of the resources of the ATE Center in 2001, the program has grown from a Partnership of seven community colleges and Penn State in 2001 to a Partnership of all 14 PA community colleges plus Penn State campuses and the Pennsylvania State System of Higher Education.

Recruitment of students into the micro- and nano-scale manufacturing programs of the Partnership requires constant attention. In general, community colleges find that recruiting students for technology programs is difficult whether addressing minority, female, or general populations. At least some of the reasons for this problem lie in (1) parental desire for students to attend a four-year degree school, (2) a perceived lack of clear paths to four-year degrees for students attending two-year degree schools, (3) a nation-wide aversion to science and technology, and (4) a lack of aggressive marketing by the community colleges. The Partnership has embarked on using three day Nanotech Camps, held in the summer at University Park for high school students, as a recruitment tool. In addition, the Partnership provides materials and tools to assist Partner institutions in marketing efforts, including nanotechnology product bags, web access to nanotechnology tool operation, a movie on a day in the life of a student who is taking the capstone experience, testimonials from industry, and testimonials from graduates.

With the number of institutions and the variety of degree types feeding into the capstone semester hands-on experience, the Partnership has established a standardized skill set, rather than a course set, that must be fulfilled by the math/science curricula at Partner institutions. Each institution must certify that this required skill set is met by the students it sends to the capstone semester. The capstone semester then builds on this entry skill set and students emerge from the capstone experience with a technician skill set established by our Industry Advisory Board.

The Industry Advisory Board which guides the Partnership is composed of representatives from all the various Pennsylvania industry sectors impacted by nanotechnology from pharmaceuticals to the alternative-energy companies. An Industry Advisory Board plays an extremely crucial role since it assesses whether or not the education being provided is meaningful to companies. One must temper its advice, however, with the understanding that in some cases an industry view can be a very “this quarter” perspective. Nonetheless, the Industry Advisory Board and its input to courses and curricula have been the principal force shaping our program. Research intensive universities also need to play a role in technology education. The innovation and vision of research intensive universities is sought after by industry to aid in keeping their products on the cutting edge and competitive internationally. That same innovation and vision of research intensive universities is also needed to aid in keeping community colleges on the cutting edge of skilled technician and production worker education.