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FAST TRACK TO HI TECH

Current Research on Targeted Workforce Development

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Both the state of Texas and the city of Austin have pursued a cluster-based approach to economic development. Since 2004, the Greater Austin Chamber of Commerce (GACC) has raised $14 million in private funds through its "Opportunity Austin" campaign to finance a five-year economic development effort targeting nine industry clusters. The attention and momentum generated by the Texas Cluster Initiatives and Opportunity Austin spurred the workforce development system in Travis County – WorkSource – to better link the workforce development system with Austin's economic development efforts. WorkSource organized its Critical Skills Shortages Project, which aims to identify and address developing skill shortages in the targeted industry sectors. It accomplishes this by sponsoring research on the targeted industries and following up on the findings and recommendations, taking action to build training capacity and start new training programs. The following article describes the process and progress in wireless technology and in biosciences – the two initial industry targets of the Critical Skills Shortages Project.[1]

Cluster-driven Economic Development

Regional economies are composed of three main types of activities: **natural resources clusters, local clusters,** and **traded clusters.** Natural resource clusters are found in regions where a particular natural resource is abundant. Local clusters are found in every region and produce goods and services that are needed by the local population, e.g., retail trade, or hospitals and medical facilities that serve the local population. Traded clusters found in a region produce goods and services that are in competition with other regions and nations. They trade across the nation and even the globe (e.g., semiconductors, medical devices). These clusters tend to be concentrated only in a few regions.

Traded clusters drive regional prosperity. While local clusters account for roughly two-thirds of employment in an average region, traded clusters are keys to the prosperity and growth of the region. This is because traded clusters can achieve higher productivity, their growth is unconstrained by the size of the local markets, and their success creates much of the demand for local clusters.[2] Traded clusters bring new value to a region rather than simply shifting value within a region.

Workforce Development's Perspective

The traditional approaches of economic development and workforce development differ significantly. In economic development, the key focus is on marketing or "branding" to attract firms and jobs to the area. Attention to specific workforce issues, if any, is typically limited to recruiting high-level out-of-area talent to fill top positions in management, engineering and marketing. Economic developers tend to leave details to the market after an initial assist through public sector incentives. In contrast, workforce developers are concerned about these "details," including which occupations might be critical for a given cluster to flourish, how local residents might best be prepared for these jobs, how long the process to prepare the workforce might take, and how this process will be financed.

A "market approach" may take many years to accomplish, during which time area residents will not be prepared for jobs, so companies will incur added costs to recruit out-of-town. Also, individual employers typically do not foresee skill shortages until they are faced with them. Firms in growing clusters frequently do not identify or project their future workforce needs and are unwilling to commit significant resources to planning.

A further complicating issue is that labor market processes are increasingly non-linear. Labor economists once could clearly articulate the "career ladders" that workers could use to

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advance within a given employer or industry if they obtained the requisite education, skills and experience. In today's labor markets, this is no longer the case. Several as yet imperfect metaphors are emerging to describe and understand the way labor markets work. Two such metaphors—the "career lattice" and the "climbing wall"—suggest that progression may require some sideways or even downward movement for workers at times as they navigate today's labor markets.[3]

This implies that there may also be related non-linear "work-arounds" for potential skill shortages, such as skill training at the community college level for graduates of four-year colleges who have the knowledge but need practical skills or experience in applying their knowledge.

Effective and timely preparation of area residents often requires considerable planning and sustained investment of public and private resources (Figure 1). To be effective, a workforce development system must give attention to the need for workers across the spectrum of skill levels. Workforce developers are aware that one must plan ahead to develop and deploy effective training programs. Traditionally, the workforce system has been charged primarily with addressing current workforce demands and training for existing jobs; however, there has been a recent move within the Texas workforce development system toward innovation and capacity-building for the emerging future. Recent experience in Austin illustrates this approach.

Workforce Focal Points

In 2004, the Greater Austin Chamber of Commerce through its "Opportunity Austin campaign" targeted nine industry clusters:

- automotive manufacturing
- biosciences including biomedical and pharmaceutical products
- product manufacturing
- wireless technology
- transportation and logistics
- computer software
- clean energy
- semiconductors
- digital media

In a 2005 report, sponsored by WorkSource, the Ray Marshall Center for the Study of Human Resources assessed these nine industry clusters according to their labor market suitability and their potential for industry engagement.[4] On the basis of this assessment, researchers chose two industry clusters for further investigation: wireless technology and biosciences. Both were emerging clusters, populated by small firms, and characterized by fast-changing technologies. About 100 firms in each cluster were located in the Greater Austin area.

The state of Texas also targeted wireless technology and biotechnology as part of both the Governor's Industry Cluster Initiative and the State Strategy on Advanced Technology. Three state funds are now established to promote and help finance economic development: the Texas Emerging Technology Fund ($200 million), the Texas Enterprise Fund ($180 million) and CAPCO, a pool of private venture capital administered by the Comptroller of Public Accounts and funded by Insurance Premium Tax Credits.

The Texas Healthcare and Bioscience Institute,

Figure 1

Critical Skills Shortages Project

Source: Ray Marshall CSHR

a statewide organization, has been strongly advocating for increased funding for biosciences. On July 16, 2005, the largest grant from the Texas Enterprise fund was announced for a joint venture between Texas A&M University and Lexicon Genetics to help establish a nonprofit Texas Institute for Genomic Medicine. Efforts were also underway to expand medical research and to build a medical school in Central Texas. In addition, a Regional Center of Innovation and Commercialization was established in Austin, providing a point of access for state economic development funding.

Scientific research is the most powerful driver of the biotech economy, and university support is critical in this process. A recent study in California concluded that scientists working at universities or research institutes have founded nearly half of all venture-backed startups.[5] Further, the study found that university faculty generally preferred to locate these startups nearby.

The University of Texas at Austin has established the Office of Technology Commercialization, aimed at moving UT innovations into the marketplace. The prospective increase in intellectual property (IP) from all this activity hopefully will bring new and expanded commercialization prospects to Austin. The increased emphasis on research and innovation is expected to increase the need for skilled workers to help implement and commercialize the new opportunities.

Critical Skills Research: Training Initiatives

To the extent that skill shortages act as a barrier to further growth in the targeted clusters, shortages are far more likely in industry clusters where the preparation process for highly skilled professional and technical workers is much longer and more elaborate. Biosciences generally fit this mold much more so than wireless. Large shares of the biosciences workforce will necessarily require college academic training, some of it at the postgraduate level. At the same time, most of the key workers in wireless technology may only need industry experience or technical certification. Thus the root causes and the associated solutions to any identified skill shortages in these two clusters will look quite different.

Following the researchers' recommendations made for wireless technology, WorkSource collaborated with ACC Continuing Education to begin non-credit courses in wireless technology, including preparation for certifications in wireless technology. Since the initial demonstration project, instruction has expanded to the ACC Computer Science department, which now offers courses in wireless technology for college credit as part of its regular curriculum.

Austin-area employers have expressed concerns about the need to attract more individuals to work in the biosciences. They want to increase the pipeline of workers who already have some basic applied knowledge of biotechnology to enter the industry. In 2006, WorkSource and its partners, including GACC, Austin Community College (ACC), and the Ray Marshall Center, received funding from the Texas Workforce Commission under its Meeting Industries' Critical Workforce Needs Initiative.

With the funding, the Austin Biotech Workforce Education Consortium began in August 2006 as a two-year project to expand and enhance biotechnical educational offerings at Austin Community College with strong input from Austin area bioscience firms. This demonstration finances the start-up of new courses and programs at Austin Community College. The project pays for faculty workplace externships in Austin-area firms in order to develop curriculum and funds the cost of tuition, fees, and books for students in the inaugural pilot courses. Once proven successful, the instruction is intended to become part of the regular offerings at the college and build a stream of future employees.

New programs were begun in three departments. First, a new program, Fundamentals of Biotechnology, was established in the Biotechnology Department as an experiment to determine if a specially designed, abbreviated training could be sufficient to prepare individuals to access entry-level jobs in the industry. If successful, the project could help fulfill the needs for suitable entry-level workers, especially in growing manufacturing positions. During the two-year period of the grant, three cycles of the Fundamentals of Biotechnology program are to be conducted with 12 students in each cycle for a total of 36 students. Thus far, WorkSource recruited all the candidates for this program through its three Career Centers. Nine students were enrolled in the pilot program at ACC beginning in May 2007.

The Fundamentals of Biotechnology program consists of two sessions, each five-and-a-half weeks long for a total program length of eleven weeks. The first session is devoted to classwork at Austin Community College. The trainees attend classes three days per week. This academic portion of the program consists of an integrated set of three courses, including an applied mathematics class, a class in bioethics focused mainly on reading and

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documentation, and a biotechnology lab course. The academic courses are integrated—so that, for example, the mathematics taught is used in the lab course at the same time. The second session in the program is an internship in a biosciences organization.

Advanced Specializations Beginning Fall 2007

The second new program under development is Molecular Diagnostics, offered to graduates with Associate or Bachelors degrees in Medical Laboratory Technology or other appropriate science fields. It is expected to be of special interest to incumbent workers. The program offers a specialty Enhanced Skills Certificate in Molecular Diagnostics for students who successfully complete the sequence of two courses and a clinical internship.[6]

The initial course in Fundamentals of Molecular Diagnostics is being taught for the first time during the fall semester of 2007. Thirteen students and an ACC faculty member have enrolled in the course. Announcement of the availability of the tuition-paid slots was first made to firms that sponsored faculty externships or helped the project in some way, and most of the students are incumbent workers in area firms.

The third program is a specialization in bioinstrumentation offered in the Electronics and Advanced Technologies Department. Project plans call for designing and implementing the initial cycle of this specialization with 12 students during the 2007-2008 school year. In this pilot demonstration, scholarships to cover tuition, fees, and books for individuals in all the courses are to be paid by the grant. (A list of courses offered with ACC's biotechnology training programs is shown in Table 1, below.)

Faculty from the ACC Department of Electronics and Advanced Technologies participated in faculty externships and visits with 11 firms followed by meetings with bioscience industry representatives who provided input and advice on the design of the bioinstrumentation program.[7] After the externships, some faculty expressed concern because bio equipment manufacturers chiefly wanted job applicants trained in electronics, with the intention to then train them on the tools they manufactured. Further, the manufacturers opposed the creation of an outside talent pool that might compete against them for lucrative service contracts. However, at the other extreme, clinics, hospitals and other users of the equipment wanted highly trained and experienced workers who are familiar with the latest equipment.

Another program concern was the ability for a community college to keep pace with the equipment needs for such advanced training. This concern was allayed when employers and firms began donating biotech equipment and several students expressed interest in the program. Further allaying concern, this equipment includes several familiar components that are used in semiconductor manufacturing.

Thus the Department proceeded with development of the certificate program, with the understanding that the need for training in this specialization will be tested in Year Two by the employability of the students. The

Table 1

Biotechnology Sciences Pilot Programs

Developed by ACC in Conjunction with the Critical Skills Shortages Project

Fundamentals of Biotechnology

First Session (5½ weeks)

BITC 1200 Fundamentals of Biological Sciences (lab)
BITC 1191 Special Topics in Biological Technology/Technician: Special Studies & Bioethical Issues of Biotechnology
MATD 0160 Topics in Developmental Math

Second Session (5½ weeks)

BITC 2486 Internship -- Biological Technology I

Molecular Diagnostics Specialization

MLAB 2378 Fundamentals of Molecular Diagnostics (4 credit hours)
MLAB 2479 Molecular Diagnostics Techniques (4 credit hours)
MLAB 2363 Molecular Diagnostics Clinical (1 credit hour)

Bioinstrumentation Technology Specialization

INTC 1491 Biomedical Instrumentation (4 credit hours)
INTC 1491 Biomedical Instrumentation (4 credit hours)
EECT 2363 Internship (1 credit hour)

Source: Austin Community College

Bioinstrumentation Technology Specialization includes a sequence of two courses and a clinical internship.

The specialization is designed for individuals who already have an Associate of Applied Science in Electronics, or other appropriate degree, or who have passed the core series of courses in electronics. For the pilot program only, these prerequisites are being selectively waived. The first course, Biotechnical Instrumentation, is being taught during the fall semester 2007. Among the fifteen students enrolled in this course, about half are incumbent workers and half are existing students in the Electronics and Advanced Technologies Department.

The pilot training programs begun by the Austin Biotech Workforce Education Consortium are works in progress and they will be adjusted and modified over time, as needed. The important point is to embrace a strategy of continuous improvement.

At the one-year mark, the Austin Biotech Workforce Education Consortium project has been successful overall. All targeted courses and specializations have been developed and are being implemented. While enrollment for the first cycle of Fundamentals of Biotechnology was below target, it did prove to be adequate preparation for entry-level jobs in biosciences. (The chief stumbling block that disqualified applicants from the program was inadequate math skills.) Further, Austin Community College has proven the viability of incorporating faculty externships in order to develop meaningful certificate programs in a short timeframe, in order to meet needs for emerging technology workforce training within the local arena.

Conclusions

Targeted training helps Texans benefit from the state's growing industries, such as wireless technology and bioscience. Linking sectoral workforce development with cluster-based economic development is both feasible and important—especially if local residents are to benefit from the jobs created. It can be implemented in any region with a pro-active community college or technical college, collaborative employers, and a progressive workforce development board.

Not all workforce problems can resolved by expanding capacity, i.e., by adding or enhancing education and training programs. Workforce development programs must match or fit employer needs to be effective. To accomplish this, employer engagement is essential. Through teacher externships and student internships, educators can gain first-hand perspective on employer needs; but employer engagement works best when employers are organized and ready to collaborate with schools. In Austin, GACC has helped to instigate the formation of industry-led groups in the targeted industries. For wireless technology, the group is the Austin Wireless Alliance; but to date the Alliance has not shown much interest in education below the university level. In February 2007, the Greater Austin Chamber of Commerce organized the formation of the BIO-Greater Austin Council. The Council established a Talent/Education Committee to identify the type of workforce needed at all educational levels, along with the skills required, and the ways to develop such a workforce.

Finally, utilization is a very critical issue. An overarching finding of the Critical Skill Shortages Project is the need to attract greater numbers of Texas students to become better prepared in science, technology, engineering and mathematics (STEM) subjects. Researchers found that several excellent community college programs are underutilized. Yet these programs lead to high-paying careers in industries targeted by economic development efforts across Texas. Invariably, they are often technical programs that require a strong preparation in mathematics and science.

References

1. This article is drawn from a series of reports by the Ray Marshall Center for the Study of Human Resources including: *Critical Skill Shortages Project: Addressing Potential Skill Shortages in Biosciences and Biotechnology in Greater Austin,* October 2005; *Critical Skill Shortages Project: Addressing Potential Skill Shortages in Wireless Technology in Greater Austin,* October 2005; and *Austin Biotech Workforce Education Consortium: First Year Report,* to be released September 2007. These reports are available in full at www.utexas.edu/research/cshr.
2. Porter, Michael E. C*lusters of Innovation Initiative, Pittsburgh.* Washington, D.C.: Council on Competitiveness. 2002.
3. Stevens, David W. *Welfare to Work Policy.* Baltimore, MD: The Jacob France Institute, University of Baltimore. July 2001.
4. Ray Marshall Center for the Study of Human Resources: *Critical Skill Shortages Project: Recommendations for Selection of Two Key Industry Clusters for Further Work.* Available at www.utexas.edu/research/cshr.
5. Zhang, Junfu and Nikesh Patel. *The Dynamics of California's Biotechnology Industry.* San Francisco: Public Policy Institute of California. 2005.
6. A description of the certificate program can be accessed at: www.austincc.edu/biot/acc/packet.pdf www.austincc.edu/mlt/md/md_ certificate.html.
7. Firms included Ambion, Luminex, Statagene, Austin Regional Clinic, Austin Diagnostic Clinic, Clinical Pathologies Laboratory, Capital Biomedical, Pharaform, St. David's North Austin Medical Center, and the Seton Medical Centers in Austin and Round Rock, as well as the California-based firm, Bio-Rad Laboratories.

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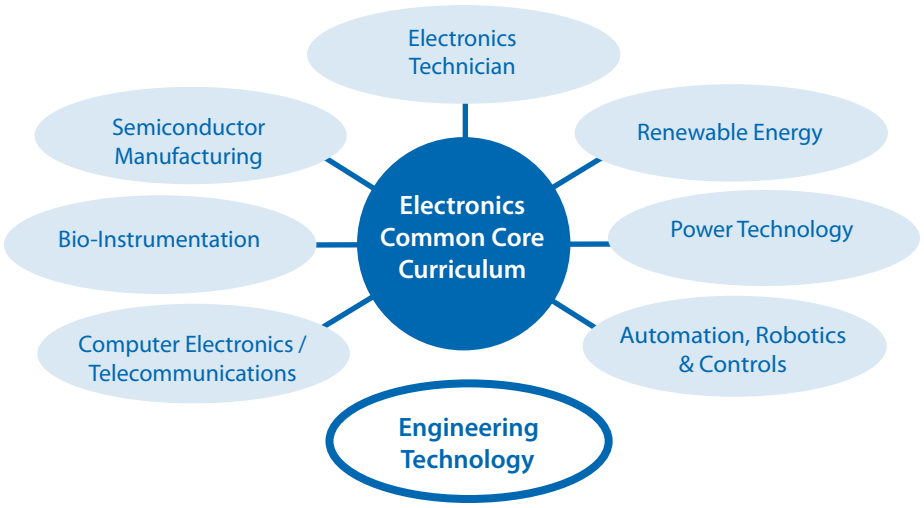
Curriculum Design of the Department of Electronics and Advanced Technologies at Austin Community College, July 2007



Many high-tech curriculums are based on a common electronics core.

Source: Austin Community College

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