

Austin Biotech Workforce Education Consortium: First Year Report

A Report for *WorkSource* – Greater Austin Area Workforce Board

A Research Initiative of *WorkSource*-Greater Austin Area Workforce Board

Prepared by

Robert W. Glover

September 2007



Ray Marshall Center
for the Study of Human Resources

Lyndon B. Johnson School of Public Affairs
The University of Texas at Austin
3001 Lake Austin Blvd., Suite 3.200, Austin, TX 78703 (512) 471-7891

Table of Contents

Table of Contents.....	i
Introduction	1
The Fundamentals of Biotechnology Program	2
Program Description and Experience	3
Texas Skill Standard Board Endorsement	6
Molecular Diagnostics	6
Industry Input into the Molecular Diagnostics Program.....	9
Bioinstrumentation.....	10
Other Project Activities	13
Activities of the Austin Biotech Workforce Education Consortium.....	13
BIO-Greater Austin Council and its Talent/Education Committee.....	14
Outreach to High School Youth and their Parents	15
Summary and Conclusions	18
Conclusions to Date on the Fundamentals of Biotechnology Program.....	19
Conclusions to Date on Molecular Diagnostics	20
Conclusions to Date on Bioinstrumentation.....	20
Observations on Outreach to Parents and Youth.....	21

Introduction

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.

The project paid for faculty externships in the workplace Austin bioscience firms in order to develop the curriculum offerings in three areas. First, a new program, *Fundamentals of Biotechnology*, is designed to prepare individuals with no bioscience background to work in entry-level jobs in the industry was to be developed and implemented by the Biotechnology Department at Austin Community College. Essentially, this program was to offer a "short cut" approach to entering the industry for individuals new to biosciences. 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.

The second area of focus in the project is Molecular Diagnostics. A program of courses and internships is to be designed and implemented to offer a specialty certificate in Molecular Diagnostics. This specialty program will be available to graduates with Associate or Bachelors degrees in Medical Laboratory Technology or other appropriate science degree. It is thought to be of special interest to incumbent workers. Plans under the project are to design and implement the first cycle of this course with 12 students during the 2007-2008 school year.

The third area of the project's focus is Bioinstrumentation. A specialization in Bioinstrumentation is being established in the Electronics and Advanced Technologies Department at Austin Community College. 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. Once developed and implemented, Austin Community College expects to continue to offer these courses and programs beyond the period of the contract without continuing grant support.

WorkSource administers the Austin Biotech Workforce Education Consortium with a subcontract to Austin Community College for educational activities and to the Ray Marshall Center for the Study of Human Resources for evaluation. This report covers activities and accomplishments during the first year of the project from August 2006 through August 2007.

The Fundamentals of Biotechnology Program

The aim of the *Fundamentals of Biotechnology* program is to develop a consolidated "short cut" program for individuals who had no prior background in biotechnology to prepare them for entry-level jobs in biotechnology. The program concept was loosely based on the Bridges to BioTech program implemented by San Francisco Community College. The Biotechnology Department at Austin Community College had previously taught courses based on the curriculum used in San Francisco and concluded that some revisions were needed for use in Austin.

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. The *Fundamentals of Biotechnology* is a pilot demonstration effort to determine if the abbreviated training path offered is 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.

WorkSource recruited all the candidates for this program through its three Career Centers. Altogether, thirty people were referred to the Biotechnology Department, where they were interviewed and screened by Stephen Spurlock, assistant to Department Chair Dr. Linnea Fletcher. The selection criteria were as follows:

- 1) Age 18 or older
- 2) U.S. Citizen or Legally eligible to work in the United States
- 3) Registered with selective service (for males born after 12/31/1959)
- 4) Have access to reliable transportation
- 5) "College ready" that is, either passed the Compass Tests in mathematics, reading and writing as required by the Texas Success Initiative, or prove exemption from this requirement. Also, successfully negotiated the registration process at Austin Community College.
- 6) Pass the interview

The mathematics testing requirements (indicated in #5) eliminated many of 30 applicants, leaving 9 who were ultimately enrolled. Only one applicant was eliminated in the interview. She had responded to the question: "What would you do if you messed up a sample?" with the disturbing answer: "Try to fix it before my supervisor found out."

Program Description and Experience

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 class work at Austin Community College. The trainees attended classes three days per week. This academic portion of the program consisted of an integrated set of three courses, including an applied mathematics class, a class in bioethics

which mainly focused on reading and documentation, and a biotechnology lab course. The official course numbers in the program were as follows:

First Session-Five and a Half Weeks

BITC 1200 Fundamentals of Biological Sciences (lab course)

BITC 1191 Special Topics in Biological Technology/Technician:
Special Studies and Bioethical Issues of Biotechnology

MATD-0160 Topics in Developmental Math

Second Session-Five and a Half Weeks

BITC 2486 Internship-Biological Technology I

The academic courses are integrated—so that, for example, the mathematics taught is used in the lab course at the same time. Although the three instructors had never taught together before, they were able to successfully integrate their classes, by meeting weekly and through email exchanges. The second session was an internship in a biosciences organization.

Of the nine students who began the courses, two dropped out before participating in the internship. One of the dropouts was ordered to bed by her doctor to save her pregnancy. The other had to leave the U.S. to go home to Asia.

Among the remaining seven students, one worked as an intern at Cellz Direct, one interned at Stratagene, two served internships at Ambion and three were interns in labs at the Texas Department of Health.

Of the seven who participated in the internship course, three have decided to continue their studies in the regular biotechnology program at ACC. One of these was hired into a regular job at his internship site. One left town after the program to begin a bachelors program at Johns Hopkins University. After participating in the program, one person got a

job in a lab for a clinical trials research organization, but quickly found out that he did not have sufficient skills to work at the position. Two of the three interns at the Texas Health Department were successful and are awaiting the posting of a job opening so that they can apply at the Department. The third intern at the Health Department encountered difficulties fitting in with the culture of the lab at which she was working. The difficulty was a matter of personality conflicts rather than inadequate skills.

Thus to date, of the seven students, only one entered regular employment at the organization where he interned. However, there were complicating circumstances at the employers of the other six students. Ambion was restructuring and was under a hiring freeze. The Texas Department of Health had to follow civil service provisions to hire anyone into regular employment. Five of the six other students performed satisfactorily on their internship and may have been offered a job at the end of their internship had it not been for employer circumstances.

All internship positions were arranged prior to the beginning of the program. Dr. Linnea Fletcher toured the businesses and then met twice more with the businesses with the most promising internship sites. She tried to probe for information of possible entry-level worksites without alienating the firms. She learned what the internship jobs entailed and confirmed the skills needed.

ACC Biotechnology Department staff accompanied students the first day of their internship and introduced them to their internship supervisors. About mid-way through the internship, Biotechnology staff made a follow-up visit to the worksite to obtain evaluations and feedback about the intern's performance from both the supervisor and the intern. At the end of the internship, students made a presentation, which was held either at ACC or at the worksite. In the presentation, they described

the organization, its purpose, and history. They summarized what they did on their internship and how it fit with the organization's purpose.

A common comment from the students was that their ACC training was "one level above the work they performed on the internship."

Texas Skill Standard Board Endorsement

On May 22, 2007, after several months of working through the application process, the Biotechnology Department presented its program for Biotechnology Laboratory Technician AAS Degree to the Texas State Skill Standards Board for their endorsement. Professor Linnea Fletcher made the presentation, accompanied by an employer representative from her program advisory board. The Board unanimously endorsed the Austin Community College Biotechnology Laboratory Technician AAS Degree program, with members making several laudatory comments in the process.

Molecular Diagnostics

Faculty members at the Medical Laboratory Technology (MLT) Program at Austin Community College perceive molecular diagnostics to be a rapidly growing field in medical laboratory technology in Austin. A dozen years ago, molecular diagnostics was usually performed only in university laboratories by faculty and graduate students. Today, thanks in part to the increasing use of automation in diagnostic processes, molecular diagnostics is commonly performed in hospitals and medical laboratories. In addition, a few Austin biotechnology firms are developing molecular diagnostic test kits. Indeed, only one hospital in Austin currently does not have a molecular diagnostics laboratory and that is because only they do not currently have space for it. They contract out this work to a local laboratory.

Professor Terry Kotrla of ACC's MLT program predicts that at least a basic introduction to molecular diagnostics ultimately will need to be taught as a part of the regular associates degree program in Medical Laboratory Technology. Her collaborating employers agreed and noted that "it is the right time" for this specialization program. In August 2007, Australia's largest medical diagnostics company, Sonic Healthcare, LTD, bought a controlling interest in Austin's Clinical Pathology Laboratory. The company has decided to locate in Austin its main molecular diagnostics laboratory to serve the entire United States. Workers with skills and knowledge in molecular diagnostics are highly sought now. As genetic research advances and as more and better molecular diagnostic tests come on line, the demand will certainly increase.

The Molecular Diagnostics specialization certificate has strong support from three major employers in Austin: Clinical Pathology Laboratory (CPL), Austin Regional Clinic (ARC), and Austin Diagnostic Clinic (ADC). Two of the three have already offered positions for the student clinical internships in the program; the director of the third clinic believes the clinic does not currently conduct enough molecular diagnostic testing to provide a full internship—as compared with the other two clinics.

Professor Terry Kotrla serves as the key faculty member for molecular diagnostics. She began her preparation by participating in a Certificate program in Molecular Diagnostics offered by the Molecular Laboratory Diagnostics Program at Michigan State University (http://bld.msu.edu/mol_lab.html). The program involved taking two classes on line, combined with one week of intensive hands-on clinical wet lab experience at the Michigan State campus in Lansing. Ms Koria also participated in teacher externships with a variety of Austin area firms, including Ambion, Cellz Direct, the Texas Department of Health,

Luminex and other biotechnology companies. She characterized many of these visits as detailed tours, focused on learning about the work of these organizations and the skills their workers needed. Subsequently, she spent eight hours with Austin Regional Clinic and two full days at Clinical Pathology Laboratory in their molecular diagnostics lab.

The program she has designed offers a specialty Certificate in Molecular Diagnostics for students who successfully complete the sequence of two courses and a clinical internship. The Certificate program is described at the following website: http://www.austincc.edu/mlt/md/md_certificate.html.

The three courses are as follows:

MLAB 2378 Fundamentals of Molecular Diagnostics 4 college credits

MLAB 2479 Molecular Diagnostics Techniques 4 college credits

MLAB 2363 Molecular Diagnostics Clinical 1 college credit

The initial course in Fundamentals of Molecular Diagnostics is being taught for the first time during the fall semester of 2007 (See the website for this class at <http://www.austincc.edu/mlt/mdfund/mdfund>). Thirteen students and an ACC faculty member have enrolled in the course. Most of these students are incumbent workers in area firms.

Announcement of the availability of the tuition-paid slots was first made to firms that sponsored faculty externships or to firms that supported the project in some way. None of the participating firms had expected to receive these tuition-paid slots for their employees. In a sense, the project worked well because Austin Community College was able to give back something immediate and tangible to their industry partners for the time and trouble they spent in providing faculty

externships or assisting the project. Even more important, once operational, the Molecular Diagnostics certificate program will help provide a workforce with the skills clearly needed by these employers. Other Austin bioscience employers, including all area hospitals, were also notified of the opportunity to send their workers to this program.

This certificate program is targeting individuals with an Associate of Science in Clinical Laboratory Science or with a Bachelor's degree in Science degree in an appropriate field such as microbiology or biotechnology, who wish to obtain an entry-level position in a Molecular Diagnostics Laboratory.

The Molecular Diagnostics Certificate program is a collaboration between the departments of Biotechnology and Medical Laboratory Technology. The departments are located in the same campus building and they share the same laboratory facilities. In fact, the second course in the certificate sequence—Molecular Diagnostics Techniques—will be taught by a faculty member who has a joint appointment in biotechnology and biology.

Industry Input into the Molecular Diagnostics Program

"I would not have set up this program without having gone to these worksites."

Professor Terry Kotrla

The Molecular Diagnostics program was established with considerable industry input received through numerous communications and site visits by faculty who valued the input.

A full-day session with subject matter experts from industry was scheduled in April 2007. Entitled an Austin Competency Analysis Profile (ACAP), this session with subject matter experts is designed to make explicit the qualities, knowledge and competencies needed to perform jobs

in this field (See a list of ACAPs completed at ACC through 10/27/04 at http://irt.austincc.edu/ids/curriculum/acap_report.html)

However, Susan Moore—the person who conducts ACAP sessions for ACC—was temporarily on leave from the college during the spring and summer. She has returned and the ACAP session on Molecular Diagnostics has been re-scheduled on September 14, 2007.

Over the longer run, the Medical Laboratory Technology Department will help assure continued input from industry by adding Molecular Diagnostics employers to the Department's Industry Advisory Committee, which also now includes employers who hire workers in phlebotomy and medical laboratory technology. In addition, Professor Kotrla plans to re-visit the employers with whom she did her faculty externships. Also, she intends to develop a network of her molecular technology graduates so that they can keep in touch and continue to learn from one another in this rapidly advancing field.

One problem noted to date is that people with jobs often have limited availability to get away to take classes on the ACC campus. Thus Professor Kotrla plans to put the courses on the web and offer them through distance learning so that they may be taken at the employee's convenience. Ms. Kotrla has the interest and ability to accomplish this task since she has a Master's degree in Distance Learning.

Bioinstrumentation

Faculty from the ACC Department of Electronics and Advanced Technologies also participated in Faculty Externships and visits with several firms. Professor Jesus Casas, who is the lead instructor on this project, made contact with and/or visited 11 firms: 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. In addition, a meeting of bioscience industry representatives was convened on April 26th, 2007 to provide advice on the design of the bioinstrumentation program.

Representatives from five firms attended: Austin Diagnostic Clinic, Austin Regional Clinic, Clinical Pathology Lab, INCELL, and Origen Biomedica.

Professor Casas came away from this experience pessimistic about the employment prospects for graduates of a bioinstrumentation program. In his perception, bio equipment manufacturers just wanted job applicants trained in electronics; they claimed that once hired, the firm would 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. At the other extreme, clinics, hospitals and other users of the equipment wanted very highly trained and experienced workers who are familiar with the latest equipment. Casas doubted that a community college could keep pace with the equipment needs for such advanced training.

Others in the department (including the department chairman) came away with more optimistic views as additional contacts were made with employers and firms began donating biotech equipment. Also several students started expressing interest in the program. Thus the Department decided to proceed with development of the specialization. Their hypothesis that the training is needed will be tested in Year 2 by the employability of the students.

The faculty designed a Bioinstrumentation Technology Specialization to include three courses:

INTC 1491 Biotechnological Instrumentation

4 credit hours

INTC 1491 Biomedical Instrumentation	4 credit hours
EECT 2188 Internship	1 credit hour

The specialization is designed for individuals who already have an Associate of Applied Science in Electronics, or other appropriate degree, or who have taken and passed the core series of courses in electronics. However, the prerequisites are being selectively waived for the first experimental program only.

The first course, Biotechnical Instrumentation, is being taught during the fall semester 2007. Fifteen students have enrolled in this course. About half are incumbent workers and half are existing students in the Electronics and Advanced Technologies Department.

Industry has contributed a generous supply of older-generation biomedical and biotechnical equipment and a classroom in the Electronics and Advanced Technologies Building at the ACC Riverside Campus has been devoted to the Bioinstrumentation specialization. Faculty have examined the donated equipment and found several familiar components that are also used in equipment for semiconductor manufacturing.

Professor Casas plans to group his students in teams pairing those with strong backgrounds in electronics with those who have less knowledge of electronics. He will focus his teaching on the components and how they fit together as a system. This approach should help maximize the transferability of learning to other industrial applications.

Other Project Activities

Activities of the Austin Biotech Workforce Education Consortium

Three meetings of the consortium were held during the past year. The first was held on August 31, 2006 to review the contract and to assure that all organizations knew their roles and responsibilities.

The second was a kickoff meeting to introduce the project to the Austin bioscience employers. This meeting was organized by the Greater Austin Chamber of Commerce and held on October 31, 2006 at the Chamber's offices. The meeting attracted several representatives from Austin-area bioscience firms.

The third meeting of the consortium was held at Austin Community College on March 1, 2007 to review progress of the project. Representatives from the three ACC departments—biotechnology, medical laboratory technology, and electronics—and from the Ray Marshall Center attended. *WorkSource* staff led the meeting, which focused on employer outreach, faculty externships and the status of curriculum development, student eligibility and screening, and the development of awareness materials targeted toward high school students.

In addition, several meetings of various subgroups have been held over the course of the project during its first year. For example, on April 26, 2007, a special meeting of industry advisors was called to advise the Department of Electronics and Advanced Technologies on the design and development of the Specialty Certificate Program in Bioinstrumentation. Representatives from five firms participated in this meeting.

BIO-Greater Austin Council and its Talent/Education Committee

During February 2007, the Greater Austin Chamber of Commerce in an effort to promote the growth of bioscience business in Austin organized the formation of a group that came to be known as the BIO-Greater Austin Council. Individuals from the bioscience industry stepped up to lead the council. Meeting for the first time on February 9, 2007, the BIO-Greater Austin Council decided to conduct an on-line survey of life sciences firms in the Austin area, collecting basic descriptive information about them to develop an accurate comprehensive listing by appropriate business category and NAICS code.

The Council established five committees, including the Workforce/Education Committee (subsequently named the Talent /Education Committee). In its initial meeting on May 8th, the committee elected Dr. Linnea Fletcher as chair. Dr. Robert Glover agreed to assist. The committee reviewed a list of issues to be addressed and decided to focus on two issues initially:

- 1) Identify the type of workforce needed (skills required)
- 2) Identify ways to develop the type of workforce needed

The committee spent two subsequent meetings reviewing the responses to the initial workforce questions on the survey of bioscience firms and brainstorming ideas regarding the two issues listed above. Members decided to sponsor a Life Science Human Resources Roundtable, inviting human resource executives from life science firms to collect information from them about their firms and human resource practices and to obtain their ideas regarding their specific needs. The Committee aims to encourage networking among these life science executives (an element of the broader networking that the BIO-Greater Austin Council wants to promote among life science firms in Central Texas). Also, an

objective of the event is to solicit their views regarding what information and activities would be of most value to them. The Roundtable is scheduled for the morning of September 27, 2007.

Outreach to High School Youth and their Parents

One of the goals of the Consortium is to “launch a coordinated marketing campaign to educate high school youth and their parents about career opportunities in biotechnology.” The initial idea proposed at the start of the project was to develop and disseminate 2500 copies of a video. Subsequently, the Consortium decided to use the Internet. As we soon learned, several websites already exist that could offer useful resources for this objective. Some selected suggestions are indicated and annotated as follows:

BIO-LINK

<http://www.bio-link.org>

This is the website of the national Bio-Link network, an Advanced Technology Education Center funded by the National Science Foundation (NSF). Dr. Linnea Fletcher of ACC has been a participant in this network since its inception and she serves as its South Central regional director. This site has a section for students, which includes two streaming videos and a series of “Career Scenarios” profiling a sampling of individuals in various career opportunities available to biotechnicians in the life sciences industry. The information on this site needs updating and we could add more complete and up-to-date information on life sciences in Central Texas.

BIO (Biotechnology Industry Organization)

<http://www.bio.com>

BIO (Biotechnology Industry Organization) is a major national industry association in biotechnology. BIO.com claims to be a comprehensive site for information and services related to biotechnology and pharmaceutical industries. The site features news about new discoveries and developments affecting the industry. The site also contains a career center on which life science employers can post jobs and applicants can post resumes. The job listings can be searched by employer, job category, or location. The site also contains brief articles providing advice and guidance to job seekers in biotechnology and life sciences.

Dolan DNA Learning Laboratory

Cold Spring Harbor Laboratory

<http://www.dnaftb.org/dnaftb/>

<http://www.ygyh.org/>

These sites are examples of the wealth of biotechnology educational materials available on the Internet. These sites offer multi-media presentations on DNA. The listed first contains an animated primer on the basics of DNA, genes and heredity. The second site provides a multimedia guide to genetic disorders

WHYVILLE

<http://www.whyville.net/smmk/nice>

and

GET THERE TEXAS

<http://www.gettheretexas.com/>

Whyville is a virtual world aimed at teen and pre-teen girls and boys. It offers games that are geared to present abstract problems (such as the "Whypox" game) and foster a career interest in biotechnology and other fields. Whyville was recently provided a grant from the Texas Workforce Commission to augment and improve its career resources on

biotechnology and advanced manufacturing. The material will be integrated into the GetThereTexas, a web-based system currently under development by the Texas Business and Education Coalition, the IC² Institute, and other partners to address workforce development needs in Texas by facilitating connections among students, educators, and employers. GetThereTexas is also funded by the Texas Workforce Commission.

Texas Life Science

<http://www.TexasLifeScience.org>

This is the website of the Texas Healthcare and Bioscience Institute, the major life sciences organization in Texas. This site is a source for biotechnology developments and activities in Texas. It has a section for job and resume postings; but oddly, no Texas employers posted any jobs (as of 9/5/07).

Career Voyages

<http://www.careervoyages.gov/>

This site is the result of a collaboration between the U.S. Department of Labor and U.S. Department of Education. On the left margin, the site features information on emerging industries, including biotechnology and nanotechnology aimed at parents, students, career changes and career advisors.

Biotech Work Portal

<http://www.biotechwork.org/>

This site provides information on careers, education and training, biotech news and labor market information.

BioWorks University

<http://www.bioworksui.com>

This site is under development by the Private Industry Council in Indianapolis, Indiana as an online campus where students and parents can explore careers in health care and biotechnology. When completed, it will contain games, interactive science lessons, and links to career resources in biotechnology and health care.

In addition to several of the sites mentioned above, numerous other websites offer career information and job and resume posting. Some examples include the following:

HireBio—Biotech Jobs, Learning Resources and Career Tools

<http://www.hire.bio.com>

Bioexchange—Enabling the Life Sciences

<http://career.bioexchange.com>

Career Builder.com

<http://science-biotech.careerbuilder.com>

WorkinTexas

<http://www.twc.state.tx.us>

Summary and Conclusions

Overall, the project has been successful and is off to a good start in its first year. All of the courses and specializations have been developed and are being implemented. The first cycle of the *Introduction to Biology* Program enrolled nine students—which was three students fewer than its goal of twelve. But with a total of 28 enrollees between them, the first classes in both of the specializations in molecular diagnostics and bioinstrumentation are beginning with four students beyond their goals.

It is unfortunate that the Austin Competency Analysis Profiles (ACAPs) for Molecular Diagnostics and Bioinstrumentation planned for spring 2007 had to be cancelled due to the temporary absence of the expert facilitator. It would have been useful to have in hand a systematic

analysis of the competencies in these occupations prior to the beginning of classes. But the cancellation was beyond the control of the project and the ACAP sessions have been re-scheduled to as soon as September 2007.

Conclusions to Date on the Fundamentals of Biotechnology Program

Several tentative conclusions regarding the *Fundamentals of Biotechnology* program can be made at this point.

- 1) There are entry-level jobs in the biosciences for which a "short-cut" eleven-week *Fundamentals of Biotechnology* program is adequate preparation.
- 2) The key differences between the eleven week *Fundamentals of Biotechnology* program and the regular one-year certificate or two-year associates degree program at ACC is the concentrated emphasis on fundamental applied skills, such as making solutions, media preparation, and packaging. In biosciences, packaging can be complicated because various products must be shipped at different temperatures and all must be correctly labeled and the correct lot number and other documentation noted.
- 3) The chief stumbling block which disqualified most job applicants from entering the *Fundamentals of Biotechnology* program is inadequate math skills. Even trainees at the entry level must be able to apply ratio and proportion and simple algebra.
- 4) The *Fundamentals of Biotechnology* program has offered a means to provide trainees without a bioscience background access to the field of biosciences and to interest them in working in the bio industry. At this point, three of the seven students who completed the program have decided to continue their studies in ACC's Biotechnology program and one is entering college for a bachelor's degree. It is clear that they saw the advantage of for further study to work in the biosciences. Six of the seven students have expressed their intention to work in biosciences as a career. Longer-term follow-up will be needed to confirm whether these plans are realized.

- 5) Skills and knowledge alone do not qualify trainees for work. Because laboratory work often involves working in teams, personality attributes and cultural fit are important as well.
- 6) Internships can be a gateway to a regular job, especially since many employers use internships as a device to screen job applicants. However, as illustrated by the experience during the first year of this project, some complications can arise. For example, due to civil service constraints, the Texas Department of Health cannot hire interns directly into regular employment. In part, because the Health Department conducts a lot of repetitive laboratory work, the Texas Health Department offers an ideal placement for entry-level interns; but the internships may not lead to jobs with the sponsoring organization, even for high-performing interns. Time will tell if these completing students can be placed with life science employers elsewhere.

Conclusions to Date on Molecular Diagnostics

The Molecular Diagnostics program is off to a good start, with strong support and assistance of several employers who recognize the need for it. At this point, the design of the project appears to be working especially well. In return for their assistance, employers have been invited to send their employees to these pilot demonstration classes for the Certificate in Molecular Diagnostics free of charge. In other words, employers gain an immediate reward for collaborating. Another attractive feature is the plan to build a network of alumni from this program so they can help one another keep up with this rapidly advancing technology.

One uncertainty is whether incumbent workers will have the time and availability to come to Austin Community College for this specialty. To accommodate them, the first two courses of the program may need to be modified into a blended learning format that incorporates distance learning and the clinical internship may need to be blocked into a more compressed time frame.

Conclusions to Date on Bioinstrumentation

At this early stage, the continued success of the Specialization in Bioinstrumentation is less certain than it is for the Certificate in Molecular Diagnostics. Whether the pessimistic or optimistic interpretation of labor market prospects for this specialty prevails is not clear at this stage.

The strategies devised for teaching the bioinstrumentation classes seem appropriate and reasonable. Focusing on components and how they fit into a system is an approach that should have a lot of transferability. The big unknown at this point is whether bio employers will hire the graduates of the program in sufficient numbers. We should have a better picture of the prospects after the student workplace internships are solicited.

Observations on Outreach to Parents and Youth

Using the Internet makes more sense than the original proposal to produce and distribute 2,500 videotapes or videos on CDs. Whatever form this effort takes, it should link with the great wealth of sources and resources on biotechnology and life sciences already on the Web, including any other successful web-based initiatives funded by the Texas Workforce Commission.