National Center for the Biotechnology Workforce
www.biotechworkforce.org

Forsyth Technical Community College, NC
NH Community Technical College, NH
Indian Hills Community College, IA
Bellevue Community College, WA
Miracosta Community College, CA

Combining strengths of five premier community colleges from around the nation for new learning models to build our biotech workforce

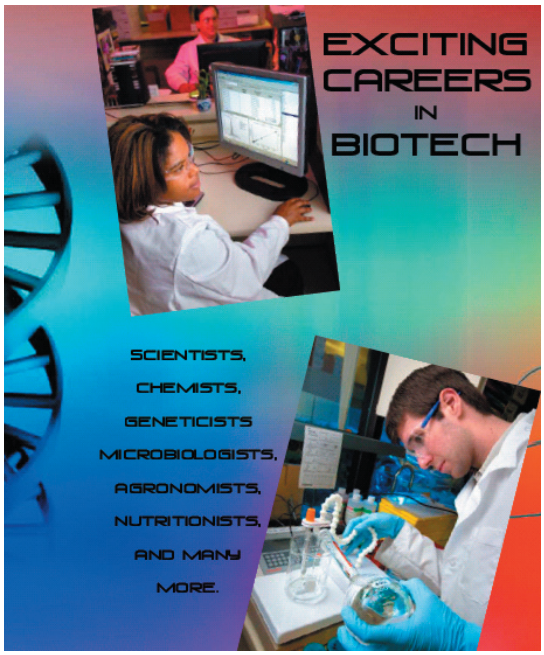
National Center Profile:
North Carolina Regional Consortium
A Regional Model in the Piedmont of North Carolina

The President's High Growth Job Training Initiative supports visionary life science sector development sparking action at regional levels. Companies, educators, researchers, entrepreneurs and governments all work together to achieve new levels of innovation.

North Carolina with 377 bioscience enterprises is, based on number of companies, the third leading state for biotechnology. Employment in biotech has grown between five and ten percent every year here since 1996. An estimated $3 billion annual biotech payroll goes to about 47,005 employees earning average salaries of $63,010.

Because North Carolina is projected to be a national leader in percentage growth of biotech jobs through 2014, the National Center for the Biotech Workforce (NCBW) responds to this demand with innovative programs that combine and strengthen partnerships to produce trained and ready workers.

Forsyth Tech, one of the five NCBW Centers of Expertise, reaches out to educational partners in its Triad region to help accomplish this goal of preparing skilled workers.



A brochure created by Guilford Community College targets high schoolers with career opportunities and other biotech ideas.

The **Forsyth Tech/Piedmont Triad Regional Biotechnology Consortium** establishes working partnerships with eight regional community colleges in the Piedmont Triad plus the surrounding area. This endeavor creates new biotechnology training opportunities in a sixteen county area.

Each of the community colleges – all in various stages of new biotech curriculum development – was awarded a $20,000 grant to help accelerate new biotech training programs. This profile reports on progress made by the **Regional Consortium**, a model program, including specific updates from each of the eight associated colleges.

The community colleges affiliated with the Regional Consortium are:

Catawba Valley Community College
Caldwell Technical Community College
Davidson County Community College
Guilford Technical Community College
Mitchell Community College
Surry Community College
Rockingham Community College
Wilkes Community College

The grant funds enabled these colleges to buy equipment and/ or do faculty training and outreach. Plus the consortium enhances 1-plus-1 articulation agreements in which a student at any one of the community colleges involved may take a first year of the biotechnology associate degree curriculum at a college close to home, then complete the second year of the curriculum at Forsyth Tech in Winston-Salem. Each of the colleges is located within an approximate one hour commute of Forsyth Tech.

***To harness the power** of biotechnology industry potential – with a skilled, ready workforce – the U.S. Department of Labor Employment and Training Administration created the National Center for the Biotechnology Workforce in 2004. Because community colleges are actively involved in meeting the needs of workers and industries in their communities, the National Center focuses energy and investments on five community colleges with different but congruent strengths in the biotechnology industry to create new curricula and infrastructure models that can easily be shared and replicated.*

The Regional Consortium Biotechnology Workforce Grant program increases the capacity of each of the eight participating colleges to deliver basic science and hands-on lab courses for the first year of the home college curriculum and supports transition to Forsyth Tech for the second year.

The curriculum was developed in the Forsyth Tech partnership. The first year includes core biology, chemistry, and lab methods courses; the second year includes the specialized biotechnology courses in genetics, microbiology, cell culture, immunology, analytical chemistry, and bioprocess and biomanufacturing techniques.

Forsyth Tech Biotechnology Program **www.forsythtech.edu**

The biotechnology program at Forsyth Tech continues to be successful in taking recent high school graduates and dislocated workers and preparing them for careers in biotechnology. With 300 students in the program, about a hundred per semester, the program has successfully operated in its new facility since January 2006. All students take an internship program established with local employers in order to graduate. Students who have graduated to date face good job prospects. More information on the National Center for the Biotechnology Workforce can be obtained at:

www.biotechworkforce.org and **www.workforce3one.org**

Generating new interest in biotechnology was one of the goals Biology teachers Sharron Jones and Emily Whiteley had in mind for the Regional Consortium grant money.

"We have mostly nurses in our Biology program, so not that many are interested in pursuing jobs in biotech," says Jones. "One of the things we did was buy equipment for DNA extraction and integrated it into our existing courses." Making the science more exciting will alert more students to the career opportunities in biotech as well. "I teach an average of 250 students per year in General Biology," says Whiteley. "This is where I feel our future biotech students will come from. Having more resources helps me focus on these students."

Situated in the heart of the Piedmont, Catawba Valley Community College is about half way between Hickory and Newton in Catawba County. The campus covers 120 acres and includes ten buildings. The Biology program has laboratories in a new building and a fourth teacher has recently been added to the faculty.

"We're using our resources to reach more students, including continuing education and an anticipated Bio-Works course," says Jones. Bio-Works is a training program for biotechnology and pharmaceutical process technicians, developed through collaboration between the North Carolina Community College System and the North Carolina Biotechnology Center, called the Partnership for Biotechnology Workforce Training. The partnership is industry-led.

With a limited budget for the department, the grant money was useful in setting up equipment for DNA extractions – always popular with students – and for the faculty to attend professional development workshops.

Kits are used for an exciting laboratory activity that isolates human genomic DNA and creates wearable DNA necklaces. "The students enjoy them but they are pricey," says Jones. "We modified it and got a vortex mixer, so we use tiny vials that are less expensive and the students are very happy with it."

Kits were also purchased that enable students to transform bacteria so they glow under ultraviolet light. And in keeping with the theme of getting students excited about biotech, other kits were purchased to use in "CSI" type activities in which students solve a "crime" using collected DNA.

Using step-by-step, careful procedures as in real biotech labs, DNA strands can be extracted from cells with household chemicals and seen with the naked eye. Students lyse their cheek cell sample and watch as wispy white strands of their own DNA precipitate out of solution in the presence of ethanol.

(continued on next page)

Catawba Valley Community College, cont.

Thanks to the grant, Jones, Whiteley and colleagues were able to attend workshops put on by the National Association of Biology Teachers (NABT) during last year's annual conference. These events enable biology educators to interact and learn, plan, prepare, and exchange ideas and inspirations with fellow educators from around the nation.

"The company that produces the DNA extraction kits was there, so we were able to get some hands-on experiences with the best representatives," says Jones, who values the informal interactions and other benefits of this gathering of professional colleagues. "I felt fortunate that we were able to attend and we got some great ideas to take home and use in our classrooms."

Taking a novel approach – demonstrating the importance of coming industrial applications of biotechnology - Caldwell Community College and Technical Institute used its grant money to upgrade and outfit a tissue culture lab in the Landscape Gardening department.

"We're in a rural area with large horticulture businesses and nursery crops," says Aaron Cook, Instructor in the Caldwell Landscape Gardening program. "The industry needs workers trained in plant skills."

Plant tissue culture (micropropagation) is used extensively in the nursery business and in plant biotechnology. It enables rapid production of many genetically identical plants using relatively small amounts of space, supplies and time.

www.caldwell.cc.nc.us

"Right now our area growers are buying tissue culture plants from the West Coast, we're interested in developing our own micropropagation industry here," says Cook. "And using the lab equipment adds more skills, in aseptic techniques and cloning." Students interested can continue their hands-on biotech experiences through articulation agreements at Forsyth Tech and Asheville-Buncombe Tech.

Caldwell Community College and Technical Institute first opened its doors in 1964. The college's Career Center, started in 1999, strengthened the college's cooperative efforts with business, industry and the public school system. Today CCC&TI offers more than a hundred curriculum programs and a variety of continuing education options.

The Landscape Gardening curriculum emphasizes intensive, practical, hands-on training in applied horticulture, including plant propagation; greenhouse and nursery plant culture; plant identification; arboriculture; diseases and pests of plants; landscape planning, maintenance, and construction.

"I don't know of any other regions getting involved in tissue culture like this," says Cook. "Developing our market locally means we can focus on special genes to get products specific to our conditions."

Caldwell's program is also involved in another area of industrial biotechnology. "There's an old landfill not too far from the college where we can draw methane, process the bio gas and use it to heat our greenhouses," says Cook. "I believe we're the only college doing gas reclamation. And we're supported by the Gold Leaf program, Handmade in America."

Because many people in the region lost jobs as the textile and furniture industries slowed down, there is a need for the kinds of new industries Caldwell supports through the work of Cook and others.

"There's an apprehension about biotech among the people here, they think it is too advanced, they'll never be able to do it. That is a hurdle we're working on, showing them that it is a viable, and we can do it. Biotech can be just another form of manufacturing, they can possibly take their skills over to micropropagation," says Cook. "It's been slow at first to get students interested. But we're beginning to build a base of interest. Bio diesel products also have big potential for the future."

"We're making progress and new opportunities for our students to grow," says Christy Carmack, Department Chair for Sciences and Physical Education at Davidson County Community College. "The grant gave eight colleges $20,000 each and we're using the money to help our classes in biology and chemistry and for faculty professional development."

Davidson County Community College (DCCC) serves approximately 16,000 students each year on the Davidson and Davie campuses plus its two satellite centers. With more than fifty different curriculum programs, the college continues to grow and expand its educational programs and services.

"We've added to the gel electrophoreses equipment and DNA work we have been doing, adding some techniques we weren't doing," says Carmack.

www.davidsonccc.edu

"These lab skills help in many ways - learning the importance of a measured activity, issues of solubility, how heat and stirring affect results. Before, because of budget constraints that limited equipment, only half the students could do the experiment at a time. Now the whole class participates together. It increases confidence."

Teachers benefited from the grant with support for attendance at events such as the North Carolina Science Teachers Professional Development Institute and the National Association of Biology Teachers Conference. These meetings feature days of interaction with professional colleagues, exchange of ideas and learning at innovative workshops.

Through the renewed partnership with Fosyth Tech, the DCCC Biotechnology program, which emerged from molecular biology and chemical engineering programs, gains capabilities to meet coming demands for skilled laboratory technicians in various fields of biological and chemical technology. The only problem is slow growth of job opportunities in DCCC's region.

"We are a rural community; we want to work in our own backyard. Opportunities in Raleigh and Winston-Salem are an hour away," says Carmack about one of the obstacles to biotech enrollment. "Many people here worked in furniture manufacturing and a lot of those jobs were lost. They have good skills, but there is a big difference between aseptic pharmaceutical work and assembling wooden chair legs."

Davidson County Community College
Equal Opportunity College

But there are hopeful signs of new biotech companies moving closer, such as in nearby Kannapolis and initiatives in High Point.

The North Carolina Research Campus, built within ruins of former textile mills in Kannapolis is designed to replace manufacturing jobs lost in recent years. The massive project is expected to create as many as 35,000 jobs in five years. Plus, in searching for biotech companies to occupy the site, the research park offers venture capital from its angel fund.

Training for these good paying jobs in emerging aspects of biotechnology begins with course work at DCCC that emphasizes biology, chemistry, mathematics, and technical communications. The Biotechnology program prepares graduates to serve in three distinct capacities: research assistant to a biologist or chemist; laboratory technician/instrumentation technician; and quality control/quality assurance technician.

Essential, hands-on lab work in such skills is done at Forsyth Technical Community College to complete the second year of the Associate Degree Biotechnology program. But a great deal of time and money is saved by students starting at Davidson County Community College.

GUILFORD TECHNICAL COMMUNITY COLLEGE

P.O. Box 309 Jamestown, NC 27282 (336) 334-4822 or (336) 454-1126 TTY: (336) 841-215

"The grant was serendipitous, we wanted to offer biotechnology courses, we had them on the books, ready to go, but we had no money for equipment," says Jameson McCann, Assistant Professor and Biotechnology Coordinator.

As a result of the Regional Consortium biotech workforce grant program, Guilford Technical Community College (GTCC) added a Biotechnology course, as well as more hands-on biotechnology elements to its Microbiology course. In addition to a second year at Forsyth Tech, the college also sends students to UNCG, A and T, NC State, and UNC. "With our lower tuition and articulation, a student can get half a four year degree at less than half the price," says McCann.

www.gtcc.edu

Guilford Technical Community College, founded in 1958, serves 12,381 students in curriculum programs and 23,330 in continuing education. McCann, in his third year at the college, is thrilled the college can offer more, using a thermocycler and other new biotech lab equipment.

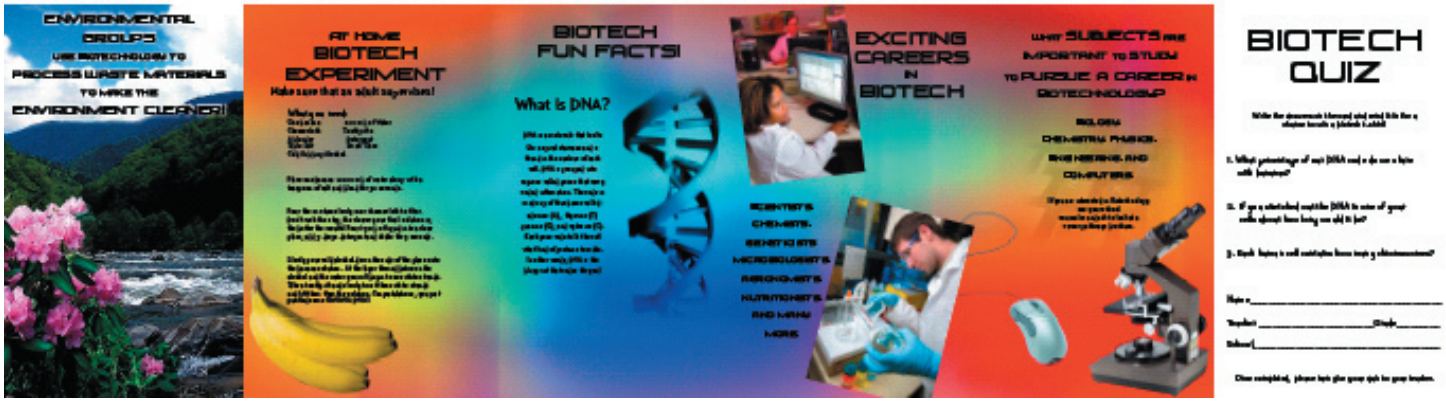
Philip King, GTCC Dean of Business and Industry, was instrumental in writing the grant. "The business landscape is changing and Philip is always looking for new relationships to get more technologies involved here," says McCann. King had entered into a partnership with Forsyth through biotech initiatives during the formation of the Pharmacy Technician Center.

"During this time he began talking about strengthening the Biotech Program at GTCC and our articulation agreement with Forsyth Tech." In addition to covering more than 90 percent of its budget for new laboratory equipment, Guilford used the money to help run seminars for teachers and outreach to area high schools. "Our idea for the grant was to start small and stimulate interest early on," says McCann. "Biotechnology at GTCC is a nascent program to address a burgeoning market – we've got to get a workforce to fill these positions." A brightly colored, accordion format brochure designed by Cheryl Hemric to appeal to high school students was produced. It's packed with stimulating ideas about biotechnology – including references to popular TV shows like "CSI" - and simple DNA experiments that can be done in a kitchen.

"When I went to the high schools to hand them out I also spoke with teachers and counselors. If we get them interested then they will get the students interested," says McCann. One part of the brochure is designed to send in for more information. "We've gotten back about ten percent, awareness is growing. And we've gotten teachers to start doing DNA gel electrophoresis in classrooms."

Since there is no new major biotech company opening a facility near the college – yet – biotech isn't competing with nursing where there is higher demand. But the stage is being set for future growth. "Biotech is a great thing, last semester we were able to use the new equipment," says McCann. "We're getting a new building and it will have four biotech labs."

Another positive part of the program is the enhanced relationship with Forsyth Tech. "It's been great getting to know the people there, Russ Read and Dr. Lucas Shallua," said McCann. "Forsyth Tech brings us better results; we learn and apply new components to improve our program. Then we attract more students and for a second year in biotech with them."



Designed to appeal to high school students, this colorful brochure includes definitions of biotechnology, experiments you can try at home, and a focus on career opportunities

‘Biotech is the wave of the future, it’s a good technology to have on campus, we can grow our labs with new equipment, hands-on, that’s the best way for students to learn,” says Tia Johnson, Natural Sciences Coordinator at Mitchell Community College. Johnson is one of four instructors involved in obtaining and executing the Regional Consortium grant. DeShaun Williams, Biology Instructor; Emily Goins, Chemistry Instructor; and Aspen Chang, Biology Instructor and Biotechnology Coordinator; are involved in implementing this grant and the new biotech course of study, set up in partnership with Forsyth Tech.

The program already has 30 students enrolled, indicating strong interest. In addition to increasing employment opportunities and advanced training available through the Forsyth partnership, another contributing factor to the new enrollments was the creation of a promotional brochure, supported by the grant, designed to alert the college community to the opportunities. Aspen Chang was instrumental in working with recruiters and counselors in the Mitchell College admissions and recruiting department to produce the colorful brochure.

“We have students willing to enroll, it’s a great opportunity, some may have issues involved in driving an hour to Forsyth, but they are determined to do what they have to do to get their educations,” says Johnson. Graduates find employment in various areas of industry and government, including research and development, manufacturing, sales, and customer service.

www.mitchellcc.edu

Mitchell Community College, founded in 1852, is a comprehensive, open-admissions community college dedicated to meeting the post-secondary education and training needs of the citizens of Iredell County and surrounding areas. Mitchell is a student-centered institution where all persons are encouraged to develop their abilities in a community that respects diversity and is supportive of individual achievement. A learning-centered institution, MCC provides affordable, high-quality educational and training programs along with services to meet changing and diverse lifelong learning needs of a multi-culturally diverse citizenry who live and work in a global society.

The Biotechnology curriculum, which built on existing molecular biology and chemical engineering programs, focuses on the demands for skilled laboratory technicians in various fields of biological and chemical technology.

Courses in biology, chemistry, mathematics, and technical communications combine to prepare graduates to serve in research or other laboratories, or as a technician in quality control, instrumentation, and other biomanufacturing tasks.

A.A.S. DEGREE
BIOTECHNOLOGY

MITCHELL COMMUNITY COLLEGE

Mitchell Community College produced this brochure to promote biotech opportunities.

Rockingham Community College established its two-year Biotechnology Program through a collaborative agreement with Forsyth Technical Community College. Rockingham provides the general education courses that support a student's pursuit of the Biotechnology Degree. Then students complete biotechnology specialty courses at Forsyth Tech with advanced, hands-on equipment that simulate actual industry conditions, to be awarded the AAS degree.

"There's been a lot of talk, which led to a lot of action, and now – we are ready," says John Crutchfield, Dean of Math and Science Division at Rockingham Community College (RCC).

As part of the partnership between Rockingham and Forsyth, a grant provided $20,000 to enhance courses at RCC that support the biotechnology program. This National Center for the Biotechnology Workforce "Regional Consortium" grant is a federal grant administered by the U.S. Department of Labor's Employment & Training Administration to support biotech education at eight community colleges in the region.

"The grant period has ended, but the partnership with Forsyth Tech continues," says Crutchfield. " RCC will continue to encourage and support students seeking the Biotechnology Associate in Applied Science Degree."

Course work at Rockingham includes biology, chemistry, mathematics and technical communications. The program prepares graduates to work as technicians in professinal laboratory environments, including quality control, quality assurance and other tasks. Graduates can find employment in various areas of the industry, including healthcare, government and biomanufacturing. Biotech backgrounds can also be applied to sales and customer service careers.

With the provided grant funds, RCC was able to add a modern fume hood with associated cabinets and counter space to the biology laboratory (Fig.1), an environmental growth chamber (Fig. 2), and twelve stereo microscopes (Fig. 3). In addition, the grant supported faculty travel to several regional biotechnology meetings.

Figure 1. Cabinets & Fume Hood

Figure 2. Environmental Chamber

Figure 3. Stereo Microscopes

www.rockinghamcc.edu

SURRY COMMUNITY COLLEGE

Celebrating 40 Years of Excellence in Teaching and Learning

630 South Main Street
Dobson, NC 27017
Telephone: 336-386-8121

www.surry.edu

Surry Community College is a community-centered, comprehensive community college with an open-door admissions policy, primarily serving Surry and Yadkin counties. Gaining the Regional Consortium Grant was a move ahead in its mission to improve and expand student learning.

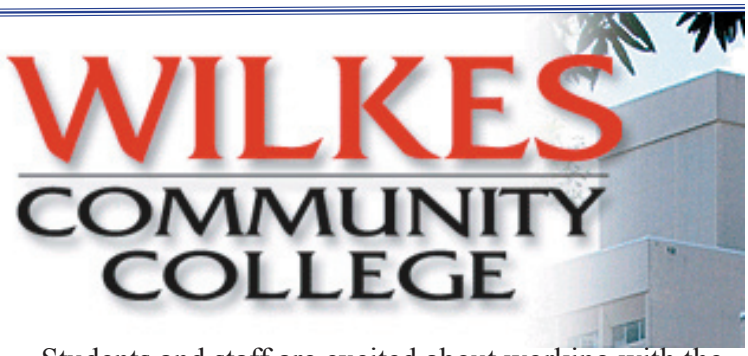
"We used the money to purchase equipment for hands-on training in our general biology classes," says Mike Ayers, Chairperson of the Science Division at Surry Community College.

Instruments and devices involved in electrophoreses, for example, contribute to better learning in microbiology, but can also have practical applications and raise greater awareness of the possibilities developing in biotech industries today. "We can also use them in tissue culture and plant propagation in our Horticulture Technology program," says Ayers.

While there are employment opportunities in nurseries, greenhouse operations, garden centers and landscape maintenance companies in the vicinity of Surry, no big biotech company has relocated there – so far. For now, students interested in pursuing growing opportunities and high paying positions in the biotech industry can take the opportunity of the partnership with Forsyth Tech and use state-of-the-art labs and facilities there.

"Part of the reason we don't have a large enrollment in biotech is because you would have to move away to find a job, but for those students who are willing to relocate, this is a great opportunity," says Ayers.

WILKES COMMUNITY COLLEGE



Resources and events are converging to boost Wilkes Community College's biotechnology program to a new level.

"The Biology department used its funds to purchase an electroporator and a UV-Vis spectrophotometer. These two items alone would not normally be sufficient to introduce students to biotechnology but, fortunately, the Biology department was also awarded a grant from the National Science Foundation to help us outfit the lab more completely," says Tom Ingledue, Biology Instructor. "It dovetailed nicely."

Factor in the hiring of two new Biology faculty members and a move into the new Lowes Science and Technology building and the quality, depth and hands-on effectiveness of the biotechnology education offered at Wilkes is significantly upgraded.

www.wilkescc.edu

The Regional Consortium Grant benefited both the Biology and Chemistry departments and enabled the purchase of a PCR machine and gel electrophoresis apparati for the separation of both proteins and nucleic acids. Wilkes students already had hands-on experience with PCR, restriction enzyme analysis, and electrophoresis. The new electroporator was successfully tested and utilized in a microbiology class. Students and staff are excited about working with the new equipment in the new laboratory environment in the fall (2007).

The enhanced partnership with Forsyth Tech benefits Wilkes Community College (WCC) students and faculty as well. Dr. Andrea Thomas will offer a class in Organic Chemistry in the spring of 2008 using the new devices along with a laboratory manual currently used at Forsyth Tech as part of its two year biotech degree. Dr. Thomas is in contact with the instructors there. The increase in biotechnology resources will help students from the Wilkes area in continuing their work at Forsyth.

The WCC biology laboratory manual is being rewritten and will feature three to four biotechnology laboratory activities designed to foster critical thinking. These activities include: quantitation of DNA (spectrophotometer), electroporation of plasmid DNA (electroporator), cloning of DNA, the polymerase chain reaction, *(continued on next page)*

Wilkes, continued from preceding page

restriction enzyme analysis of DNA, and electrophoresis of both nucleic acids and proteins.

In addition, the spectrophotometer will be utilized for testing water samples as part of environmental lab activities in the second semester of introductory biology while the electroporator will also be utilized in several microbiology courses.

Because of the increasing demand for biotech workers, the chance for high-tech training at Forsyth Tech also helps enhance the Wilkes program in other ways.

"We are currently exploring ways to advertise the fact that WCC is an institution that can lead you to a successful career in biotechnology," says Ingledue.

"Our new laboratory manual will feature a full page advertisement for Forsyth's biotech degree. WCC is committed to providing cutting-edge learning opportunities to its students. Our two grants and new facilities guarantee that these endeavors will have the best chance at success."

A Regional Model in the Piedmont of North Carolina

The Regional Consortium Biotech Workforce Development Grant has been a successful project. The programs at each community college are strengthened due to the efforts of the eight community colleges and the investments made by:

The National Center for the Biotechnology Workforce.

In the fall of 2006 another community college was added to the one-plus-one consortium. Rowan-Cabarrus Community College, in the heart of the new North Carolina Research Campus, became the ninth community college to join the partnership.

The North Carolina Community College System is also supported by programs such as BioNetwork, plus statewide regional programs of the North Carolina Biotechnology Center.

The National Center for the Biotechnology Workforce is the recipient of a Presidential High Growth Job Training Initiative Grant as implemented by the U.S. Department of Labor's Employment and Training Administration