InnovATEBIO National Biotechnology Education Center

LINNEA FLETCHER,* POORNIMA RAO

Austin Community College 3401 Webberville Rd., Austin, Texas 78702, United States

** linneaf@austincc.edu*

Abstract: InnovATEBIO Education Center is a community college-led National Science Foundation Advanced Technological Education Center built on the network of the previous national center Bio-Link, to increase industry collaboration, bringing visibility for the 169 currently existing 2-year biotechnology programs, documentation, and meeting emerging workforce technology trends. InnovATEBIO fosters the high school to college workforce program pipeline, provides professional development for faculty, and mentors the Advanced Technological Education (ATE) Biotechnology Community. InnovATEBIO also builds partnerships with trade organizations and other workforce education programs such as the Manufacturing Institutes to produce a quality technician workforce for the biotechnology industry.

Keywords: biotechnology

1. Introduction

Biotechnology has been around since the beginning of civilization. Examples are ancient civilizations that used yeast and bacteria for making bread, alcoholic beverages, and vinegar, while in Central America, the Aztecs made cakes from blue-green algae. Modern industrial biotechnology started with Genentech. It was the first company to use a cloned enzyme in E. coli to produce a human protein, somatostatin, in 1977. The company went on to produce recombinant insulin, which transformed how diabetes was treated.

Modern biotechnology is defined as the "use of the biology to make products and other purposes to improve life. "Life is in the oceans, in the soil, beneath the soil surface, on and in organisms, in water, and in the air," all of which could be exploited by biotechnology. Examples are medical such as bacterial viruses or phages to kill pathogenic bacteria, recombinant drugs such as insulin or vaccines; bio-industrial for making enzymes used in detergents, biofuels; agriculture for making fertilizers, plants resistant to pests and disease; environmental such as cleaning up waste or hazardous materials, and food such as Kombucha, cheese, and alcohol beverages. It is now even being used to make plant-based foods such as Impossible burgers or fungi to make synthetic leathers.

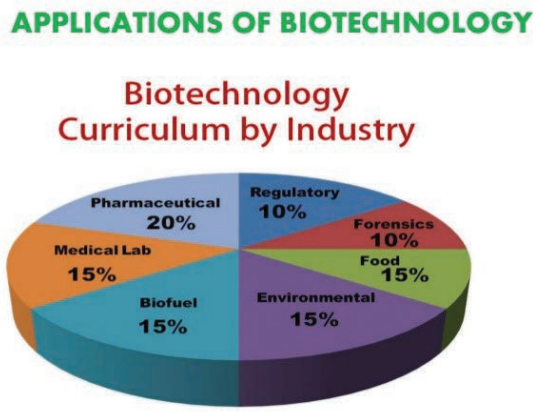

Fig. 1. Applications of Biotechnology [1]

Education Center: The InnovATEBIO National Center for Biotechnology Education. The Center is located at Austin Community College, Texas. Partnering organizations and institutions are Madison College, Wisconsin; Forsyth Technical Community College, North Carolina; DNA Learning Center, New York; Finger Lakes Community College, New York; Digital World Biology, Washington; and BABEC in California. InnovATEBIO is supported by a five-year ATE national center grant (NSF DUE 1901984). The InnovATEBIO National Biotechnology Education Center will address the need to educate highly skilled technicians for the nation's biotechnology workforce. Toward this goal, InnovATEBIO will provide leadership in biotechnology technician education, including support for developing and sharing best practices and emerging technologies in biotechnology workforce development.

Brief History: From 1998 to 2018, Bio-Link was the Next Generation National Advanced Technological Education (ATE) Center of Excellence for Biotechnology and Life Sciences, an NSF ATE grant.

InnovATEBIO will support the expansion of these resources. InnovATEBIO will continue to offer a platform to host the nation's Biotechnology Programs and Affiliate pages for its members, along with Courses in a Box and other content. Members will also continue to be able to provide content via blogs, conference presentations, publications, and event postings. In addition, members will be alerted to new content and community activities via the Center's newsletter, Facebook page, and LinkedIn site.

The InnovATEBIO community enhances biotechnology education programs by providing cutting edge professional development for instructors, by improving curriculum, by members making use of technologies, and by creating a system for sharing information among its targeted audiences of community college biotechnology programs, faculty, administrators, students, alumni, trade organizations, and industry.

Most importantly, InnovATEBIO continues to support a cadre of well-educated instructors to increase the number and quality of biotechnology education programs. InnovATEBIO helps introduce a wide range of underrepresented students to biotechnology by providing opportunities to acquire the knowledge and skills essential to the field and advance their education in math, science, and engineering.

Goals and related activities of the Center:

- **Develop a collaborative infrastructure that supports innovation and promptly addresses the needs of the biotechnology community.** Every Fall, the Center hosts a series of Community Meetings for Biotechnology Program faculty and their trade organization partners to discover their challenges and victories. For the past two years, the main challenge remains unchanged, low student enrollment and industry not being willing to hire 2-year students as technicians. Hubs focusing on emerging technology trends and concentrated expertise are being developed and implemented as part of the infrastructure to address the community's needs.
- **Develop a hub concept as an antidote to a traditional center.** Each Hub is a "go-to" place for specific expertise to create and support biotech programs in high schools and community colleges. Our decentralized infrastructure shares leadership among a unique team of biotechnology educators with a range of experience. We are a service organization ready to help the community with extensive resources.
- **Coordinate and leverage outputs from ATE-funded biotechnology projects identifying opportunities to generate partnerships and collaborations that accelerate innovation in biotechnology education.** Every Spring, the Center hosts a webinar for each funded ATE project. Annually, Jim Hewlett, Finger Lakes Community College, hosts a workshop for ATE projects who want to expand on the research generated by their project.

- **Here, we monitor and address emerging biotechnology industry and technician workforce trends.** In addition, the Center supports a National Advisory Industry Board composed of the industry leaders. Some of the topics discussed are how to convince the industry to hire 2-year students as technicians and the importance of DEI initiatives both at educational institutions and industry. The Center also helps to produce a National Workforce Report every two years with the Coalition of State Bioscience Associations (CSBI). As reported in 2021, the growth of the biotechnology industry continues to accelerate.
- **Develop a regional outreach and mentoring infrastructure to broadly engage underserved populations in biotech labs and emerging technologies.** The Center has hosted numerous workshops and webinars over the past 2-1/2 years. First, starting with a month-long series on online resources for high school teachers, progressing to a webinar series for college faculty, a concentrated series on biomanufacturing, and then this past Summer, on PCR technologies. A very popular one is the Leadership Institute which has teams of faculty working on real-world, industry-based product development. This series lasted several months and is ending with a face-to-face meeting in North Carolina at the end of May 2022.

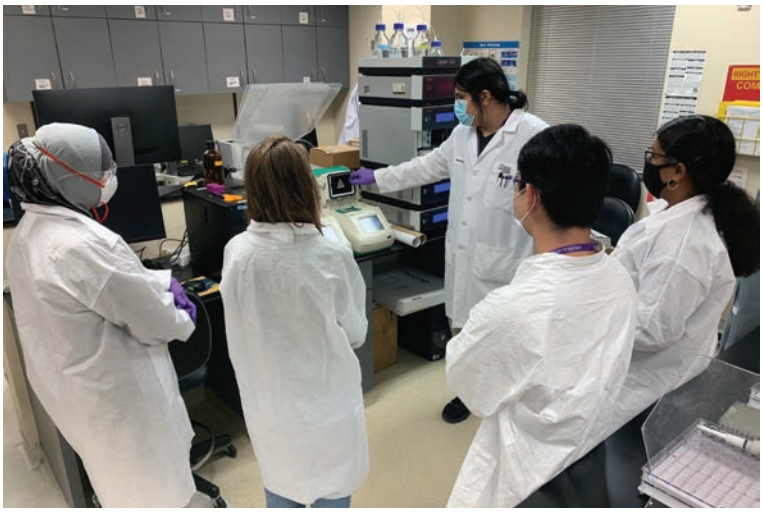

Fig. 2. Student technicians learning the functions of thermocycler equipment for PCR

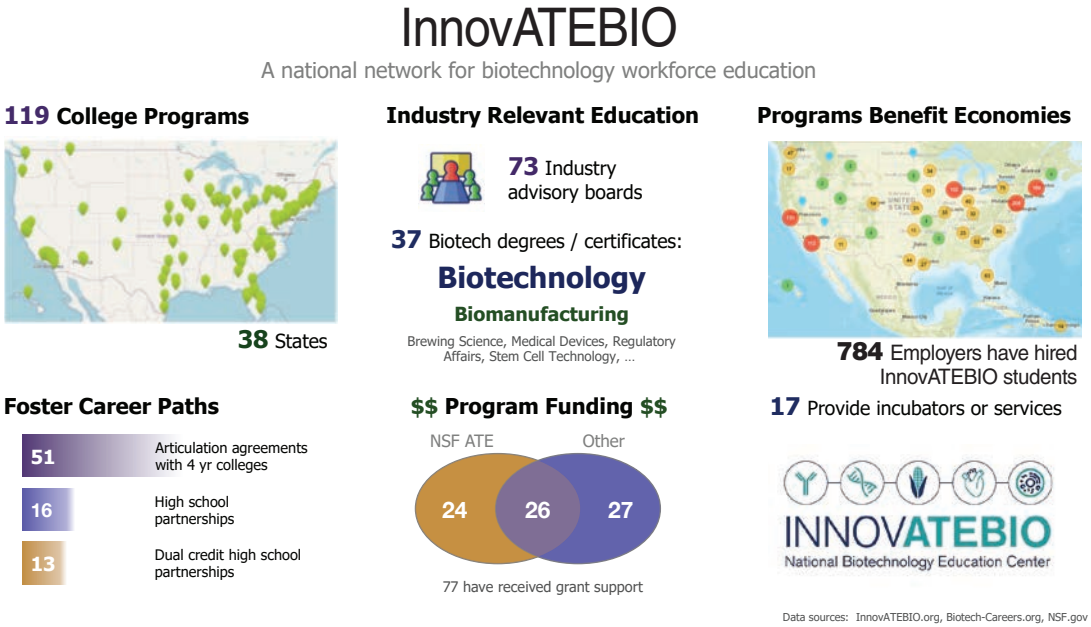

Fig. 3. Fast Facts about InnovATEBIO [2]

2. The Future

Future activities are defined by the needs of biotechnology programs, students, faculty, industry, and trade organizations. Based on community feedback, the number one challenge continues to be STUDENT RECRUITMENT. This challenge indirectly matches the number one recommendation made by the Science Board Report, "The Skilled Technical Workforce," which is "change the message." What needs to happen is a change in the message about community college biotechnology workforce programs. The public needs to learn that these programs prepare students for employment in high-tech jobs with excellent salaries.

Also, this means the industry needs to advertise technician jobs that require 2-year degrees, not 4-year degrees. Industry needs to recognize the value of skill mastery, not just a degree. A degree alone does not mean a graduate is ready for work. The degree needs to come with documentation showing what "performance outcomes" the graduate has mastered.

Another concern of the community is professional development and support for faculty. InnovATEBIO will continue to provide virtual and face-to-face professional development that reflects the changes in technology and how to gain support from their administration and local industry.

The answers to the questions "what is biotechnology?" and "what careers in biotechnology need to be readily available to students, parents, and the public. The public has known what a nurse does since Florence Nightingale in 1860, but the majority still do not know what biotechnology is and what are the possible careers in this field.

References

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[2] InnovATEBIO A national network for biotechnology workforce education https://innovatebio.org/sites/default/files/2021/05/19/InnovATEBIO%20Fast%20Facts%202021.pdf (accessed Jan 2022)