

FAST FACTS

Interviewees:

Dr. Natalie Kuldell, Founder and Executive Director of BioBuilder Educational Foundation

Angela Consani, Cofounder and CEO of Bioscience Core Skills Institute

Tom Trapp, Field Marketing Representative at Carolina Biological Supply Company

Challenge: To bridge the gap between students' desire for rewarding employment after high school graduation and the bioscience industry's need for highly skilled entry-level employees.

Solution: A comprehensive biotechnology workforce development program for high school students that includes standards-aligned curriculum, industry-aligned skills training and testing, and easy implementation.

Results: The BioTechBuilder "biotechnology in a box" program that builds student skills and supports the U.S. bioscience industry.

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BioTechBuilder: Skills-Focused Biotechnology Workforce Development Program for High Schoolers Entering the Biotech Industry

The onset of the pandemic may have slowed the economy back in 2020, but a group of dedicated science educators continued working behind the scenes to advance bioscience workforce training and the U.S. bioeconomy. Today, Carolina Biological Supply Company is thrilled to share the results of those efforts in the new [BioTechBuilder](#) program.



BioTechBuilder is an innovative, comprehensive program that meets the needs of students, teachers, school districts, and the bioscience industry. Let's look at these stakeholders' needs, the ways in which a trio of bioscience educators took up the challenge of meeting those needs, and the transformative way in which BioTechBuilder prepares the bioscience workforce.

BioTechBuilder

CAREER & TECHNICAL EDUCATION



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Stakeholder Needs

Student Needs

The number of high school graduates deciding not to enroll in college has hovered near 40% for the past several years. According to the U.S. Bureau of Labor Statistics, 39% of 2023 high school graduates chose not to enroll in college.¹ This current rate is a notable increase from a low of 29% in 2009 and even the 2019 rate of 34%.²

One commonly cited reason students are deciding to forgo college is the rising cost of post-secondary education. They don't have the money to pay for a four-year degree and do not want to take on burdensome student loan debt. That does not mean they are not interested in finding an enjoyable and lucrative career. They need a different way to learn valuable skills that can lead to meaningful, well-paying jobs.

Teacher Needs

Teachers today enjoy abundant STEM education resources, and it is common for teachers to use available discretionary funds to purchase individual resources and integrate them into their existing curriculum. Such innovative STEM learning has sparked a surge in student interest in the biosciences—and what teacher doesn't get excited when they see the engagement and joy of their students? Those teachers understand that some students do not have the means to pay for a college degree but would still like to have a career in bioscience. The

challenge for teachers is how they can help those students not only learn about bioscience, but also learn the skills they need to achieve their career aspirations.

School District Needs

School district administrators face a similar challenge. To meet the needs of those students, they must find a bioscience training curriculum that is designed specifically to equip students with the targeted knowledge and hands-on skills sought by industry employers. Even better, the curriculum would focus on skills needed by industries that have a strong presence in their region. For instance, ag biotech in regions with a strong agricultural economy, or biomedical technology in an area with a strong pharmaceutical economy.

Finding such a program is only part of the challenge. Districts also need a way to pay for it. Some districts have dedicated career and technical education (CTE) programs with separate budgets. Others need to integrate the new curriculum into a specific school's budget. In either case, funding a new program is always a challenge for district and school administrators.

Industry Needs

The U.S. bioscience industry has experienced rapid growth during the past decade. This growth is outpacing the overall U.S. economy, and it continued during the pandemic-related slowdown that began in 2020. For example, between 2018 and 2021, the bioscience workforce increased by 11% and average wages rose at double-digit rates.³ These trends are occurring across the primary bioscience sub-sectors including agricultural biotech, bioindustrial manufacturing, medical therapeutics and pharmaceuticals, medical device and equipment technology, and research and testing laboratories.

The growth of the bioscience industry creates a continuous need for highly skilled employees at all levels, including entry level positions. Employers need a way to find individuals who can prove they have the skills necessary to excel in their jobs.

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— Dr. Natalie Kuldell, Founder and Executive Director of BioBuilder

The Challenge

The challenge is to find a way to help school districts meet student and industry needs. To do so would bridge the gap between student desire for rewarding employment after high school graduation and industry’s need for highly skilled employees.

Solution

In 2023, BioBuilder and Carolina joined forces to create a program that meets all these stakeholders’ needs.

Workforce Development Curriculum

[BioBuilder Educational Foundation](#) has been bringing innovative biotech learning to classrooms since 2011. In late 2022, BioBuilder began strategic planning for a new biotech curriculum that would enable nationwide replication of the workforce pipeline they had fostered in the rural Appalachian area of [East Tennessee](#).

To do so, they collaborated closely with educators and industry partners to create an innovative and comprehensive curriculum. As expressed by Dr. Natalie Kuldell, Founder and Executive Director of BioBuilder, “We worked hard to make this curriculum a match for the ambition we know teachers have to bring a rewarding bioscience future to their graduates.”

BioBuilder gathered data from high school teachers and administrators, CTE teachers, and other educators to pinpoint the crucial features that a new biotech workforce training curriculum must have to be successfully implemented in their schools. The feedback revealed the following key criteria from the educator viewpoint:

- They need an all-inclusive program that can be implemented “off-the-shelf” without the need for extensive preparation or special teacher training.

- The curriculum must include a blend of real-world, hands-on lab experiments and the technical content to support it.
- The program content must align with academic and CTE standards.
- The content must be rigorous and relevant enough to meet industry standards.

BioBuilder also gathered data from bioscience industry professionals to identify the crucial background knowledge and skills needed for entry-level bioscience positions. In addition to specific skills, the industry professionals wanted evidence of an individual’s mastery of the essential skills.

BioBuilder’s product development team used the information obtained from educators and industry to design a new, innovative curriculum specifically for bioscience workforce training. The development team included high school teachers and STEM coordinators, high school students, and biotechnology professionals to ensure the curriculum is accessible from each of these viewpoints.

The new curriculum, called [BioTechBuilder](#), uses a modular design that provides schools with flexibility for integrating it into their school settings, calendars, and courses. The three modules and the topics and skills they focus on are:

Module 1: Lab Skills, introduces students to the science and math concepts as well as the lab and safety techniques needed to work in any laboratory environment.

Module 2: Foundations, uses a molecular framework to introduce techniques in DNA and protein analysis used in modern biotechnology.

Module 3: Applications, introduces students to industrial applications and professional practices that enable commercialization of biotechnologies.

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Each module has a teacher guide, slide decks, answer keys, and other teacher resources. The modules contain multiple 45-minute lessons that include an introduction to the topic, a list of learning objectives for each class period, lab work, kitted lab material, quizzes, and other resources. There are also homework assignments and special projects, all of which are “out-of-the-box” teacher- and student-ready.



BioTechBuilder received the 2024 [Educators Pick Best of STEM®](#) award in the CTE Champion STEM category. The winners were selected by educators for their innovation, cross-disciplinary approach, and focus on providing students with opportunities to address real-world challenges.

Dr. Lance Brand was [one of the judges](#) who selected the finalists for each category. Dr. Brand has been teaching science for 23 years in middle school, high school, and college and was recognized as a [Milken National Educator](#) in 2005. He summed up his experience of BioTechBuilder as follows: “BioTechBuilder has truly set a new standard in biotechnology education with its hands-on curriculum focused on skill-building, perfectly aligned with the needs of the biotech industry.” That is high praise indeed coming from a teacher who has 23+ years of experience with STEM curricula!

Industry-Aligned Skills Testing

At the same time that BioBuilder was developing the BioTechBuilder curriculum, another innovative organization

was collaborating with industry professionals to develop skills testing and credentialing for students.

The [Bioscience Core Skills Institute](#) (BCSI) was founded in 2020 in Kansas City, Missouri. Its vision was to develop a bioscience skills testing program to help prepare high school students for careers at companies in the Kansas City area. But, as described by Angela Consani, Cofounder and CEO of BCSI, “skills-based hiring quickly became a national conversation as the economy rolled out of the pandemic. The fast-growing biotech industry had a great need for highly trained individuals, and we now had a way for industry to find them.”

BCSI built their digital credentialing program by working with bioscience companies to identify the specific knowledge and laboratory skills that graduates need to enter the industry directly from high school. BCSI used that data to design a series of practical, rigorous, and industry-relevant tests conducted in the lab to evaluate a student’s mastery of specific skills. The test rubrics are objective, measurable, and quantitative to ensure accurate and consistent assessment outcomes.

BCSI’s industry advisory panel observes demonstrations of student testing to confirm that each test meets industry standards. Once approved by the industry advisory panel, skills testing is conducted via in-person observation by qualified third party professionals who are themselves trained and certified in the rubrics.

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BCSI currently offers testing for [14 skills](#):

The Essential Five

1. Safety: Hazard Assessment
2. Documentation and SOP
3. Numeracy
4. Aseptic Technique: Lab Bench Level
5. Small Volume Metrology



The achievement of these five microcredentials ensures that students are prepared for an entry-level position in the bioscience industry. BCSI also tests for nine advanced skills which can enhance a student's qualifications.

Advanced Microcredentials

6. Light Microscopy
7. Cell density: Hemocytometer
8. Instrumentation: pH
9. Lab Safety: Cleanup
10. Preparation of Solutions
11. Quantitative Skills I
12. Regulatory Auditor Communication
13. Current Good Documentation Practices
14. Problem Solving in a GMP Environment

Upon successful completion of a test, the student receives a stackable microcredential that communicates their mastery of that skill to potential employers. They also receive a digital badge for each individual microcredential that can be used on social media, resumes, and other platforms. BCSI currently works with more than 260 biotech training programs across the U.S. to provide students with credentialing opportunities for the biotech skills that companies need.

To further assist students in entering the bio workforce, BCSI hosts their online [Talent Marketplace](#) where bioscience companies can find proven qualified individuals

with the skills they need. Trainees and professionals also use the platform to find opportunities that align with their skills, passions, and ambitions.

The alignment of BCSI and BioBuilder tools created the skills-specific training and credentialing needed to advance the bioscience workforce. A third science education leader then worked its magic to complete the program and get it into the hands of educators.

Program Access and Support

A leading supplier of science education materials, Carolina Biological Supply Company and BioBuilder have partnered for many years to bring biotech curricula to teachers and students. It makes perfect sense that Carolina is the [exclusive distributor of the BioTechBuilder curriculum](#) and provider of the kits and testing materials for BCSI.

Carolina contributes the laboratory materials, digital access, and student/teacher support that make BioTechBuilder a comprehensive program. Carolina provides lab kits that contain all the consumable materials needed for each BioTechBuilder lab. The materials are ready to use, adding to the "off-the-shelf" convenience of the program. Professional learning opportunities can be discussed further at a district level.



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Carolina hosts the BioTechBuilder curriculum on their industry-leading Carolina Science Online platform. Teachers and students have full access to all their respective curriculum materials through an exclusive online portal. Student work can be tracked and graded on the platform, making it easy for teachers to complete those aspects of teaching a course.

Carolina is also a valuable resource in helping districts bring biotech learning to their schools. Carolina's Tom Trapp works directly with school districts, CTE programs, and teachers to help them integrate BioTechBuilder into their specific school setting. Trapp also helps them understand and navigate potential sources of funding for this workforce development training program. For workforce training programs, Tom demonstrates how BioTechBuilder helps schools secure funding via the [Carl D. Perkins Career and Technical Education Act](#) of 2006 as amended by the Strengthening Career and Technical Education for the 21st Century Act of 2018.

Results

The curriculum, skills credentialing, access, and support pieces were all in place. Next step: pilot testing.

Cohorts of high school students in Boston, MA and Worcester, MA, public schools piloted the BioTechBuilder curriculum during the spring 2024 semester. Upon completion, the students tested for BCSI microcredentials. The result: 90% of the students received one or more



microcredentials. This is a testament to the effectiveness of the BioTechBuilder curriculum.

Since then, BioTechBuilder has been implemented in numerous Tennessee and Massachusetts schools and CTE programs. The momentum is certainly building for more adoptions and student successes throughout the nation.

BioTechBuilder's off-the-shelf curriculum offers standards-aligned learning and industry-aligned skills training as a complete solution for educating a future-ready workforce to support the growing bioscience industry. Microcredentialing assessments through BCSI further support students' immediate entry into the biotech workforce after high school graduation, helping address the skilled labor shortage impacting the biotech industry today. Carolina continues to lead science education with innovative, hands-on programs that unleash student success.

References

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