CAROLINA®
CASE STUDY

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FAST FACTS

Challenge: To meet the growing entry-level employment needs of the bioscience industry and educators' need for more hands-on teaching of authentic lab experiences that lead to rewarding employment after high school graduation.

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

Results: By the 2025–26 school year:

- Approximately 900 freshmen enrolled annually in BioSTEM I
- Seven high schools and one middle school participated
- More than 1,400 students engaged across biotechnology pathways
- A four-course career and technical education (CTE) biotechnology pathway established
- Continued investment from education, industry, and philanthropy

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From One Classroom to a Regional Biotechnology Pipeline: How BioTechBuilder *Is Helping East Tennessee Build the Workforce of Tomorrow*

A Vision That Started in One Classroom

In 2019, leaders in East Tennessee faced a challenge that many communities across America continue to face today.

The biotechnology industry was growing rapidly, yet few students had meaningful opportunities to experience biotechnology before graduating from high school. Even fewer could envision themselves pursuing careers in the field.

Rather than creating another elective or after-school enrichment program, regional leaders chose a different path. They asked a simple question:

What if every freshman biology student would experience authentic biotechnology as part of their required coursework?

That question became the catalyst for one of the country's most successful biotechnology education initiatives.

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"We needed to do what we could to deploy BioBuilder in the education system where we live—because biotechnology is becoming a strategic workforce priority and building that talent is a long-lead 'supply-chain' challenge."

—David Golden, retired Senior Vice President, Eastman Chemical Company

Through a partnership among the Eastman Foundation, BioBuilder Educational Foundation, Carolina® Science, East Tennessee State University, the Niswonger Foundation, and local school districts, *BioTechBuilder* was embedded into required biology instruction, giving every student access to hands-on biotechnology learning and a built-in pipeline to capstone electives in biomedical science, agriculture, and forensics, as well as afterschool STEM clubs.

What began as a pilot in a single high school has grown into a regional biotechnology pathway serving more than 1,400 students annually and attracting national attention as a model for workforce development.

The Challenge

Across the country, school districts are being asked to prepare students for careers that barely existed a generation ago. Biotechnology is reshaping healthcare, agriculture, advanced manufacturing, and environmental science, yet many students still encounter the subject only through textbooks.

Educators wanted more than engaging laboratory activities. They wanted a way to give every student meaningful, hands-on experience while helping them develop the scientific thinking, technical skills, and confidence needed for future careers.

Regional employers faced an equally pressing challenge. Demand for biotechnology talent was accelerating, but the education pipeline was not keeping pace.

Leaders across East Tennessee recognized that solving this problem required more than creating another elective. Students needed earlier exposure, authentic laboratory experiences, and a clear pathway from the classroom to college and careers.

Why *BioTechBuilder*?

BioTechBuilder provided the framework to make that vision possible.

Developed by the BioBuilder Educational Foundation and supported by Carolina® Science, the program combines standards-aligned curriculum, authentic laboratory investigations, teacher professional learning, and classroom-ready instructional resources into a comprehensive biotechnology education solution.

Unlike traditional science programs that introduce biotechnology as a stand-alone unit or elective, *BioTechBuilder* is designed to integrate seamlessly into existing biology courses. Students move beyond textbook concepts and engage directly with the scientific practices that define modern biotechnology—from experimental design and data analysis to problem solving and scientific communication.

At the center of the program are hands-on investigations that challenge students to think like scientists while exploring real-world questions in genetics, molecular biology, bioengineering, and life sciences. Through these experiences, students build the technical competencies and critical-thinking skills that employers increasingly seek.

For teachers, *BioTechBuilder* removes many of the barriers that can make implementing biotechnology instruction difficult. Carolina's ready-to-use laboratory kits, consumable materials, teacher guides, assessments, and implementation resources enable educators to focus on teaching rather than sourcing equipment or developing curriculum from scratch.

Professional learning is equally central to the model. Before bringing *BioTechBuilder* into their classrooms,

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teachers can participate in on-demand training that builds content knowledge and confidence with biotechnology techniques. Ongoing support and collaboration ensure that educators have the resources they need to sustain high-quality instruction year after year.

The result is a program that is both ambitious and practical: one that gives students authentic laboratory experiences while providing schools with a scalable, sustainable pathway for biotechnology education.

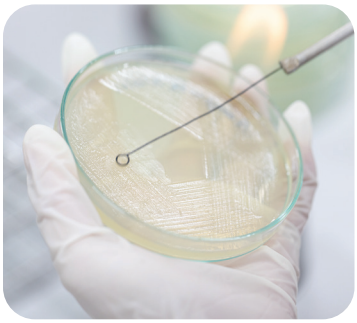
Designed Differently from the Start

BioTechBuilder was created around a simple but ambitious idea: biotechnology education should not be limited to advanced electives, specialized academies, or a small group of students already interested in STEM.

Drawing on research from the fields of science education, workforce development, and biotechnology, BioBuilder Educational Foundation developed a program that could bring authentic scientific experiences into mainstream biology classrooms without sacrificing rigor or creating additional burdens for teachers.

Rather than treating biotechnology as a collection of isolated lab activities, *BioTechBuilder* was intentionally designed as a complete instructional model. The curriculum blends real-world scientific challenges with inquiry-based learning, enabling students to apply biology concepts through experimentation, data analysis, engineering design, and collaboration.

Equally important, the program was built with classroom realities in mind. Carolina® Science helped transform BioBuilder's innovative educational approach into a scalable solution by developing classroom-ready laboratory kits, implementation resources, and educator support systems that allow schools to adopt biotechnology at scale.



The result is a fundamentally different approach to science education—one that combines the authenticity of professional biotechnology with the practicality schools need to sustain long-term implementation.

Building Industry-Recognized Skills

BioTechBuilder was designed not only to deepen students' understanding of biology, but also to prepare them for future education and employment opportunities in the life sciences.

As students progress through the BioSTEM pathway, they develop technical and professional skills that align with the needs of today's biotechnology workforce, including laboratory safety, experimental design, data analysis, documentation, collaboration, and scientific communication.

The program's four-course career CTE pathway also creates opportunities for students to pursue industry-recognized credentials and certifications, helping them connect classroom learning with post-secondary programs and careers in biotechnology, healthcare, advanced manufacturing, and related fields.

By embedding these experiences within required coursework, East Tennessee has created a model that introduces students to biotechnology careers early while equipping them with skills that remain valuable long after graduation.

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"Every student deserves the chance not just to learn about biotechnology from a textbook, but to learn how biotechnology actually works—by doing the experiments, solving real problems, and collaborating the way scientists do."

—Dr. Natalie Kuldell, Executive Director of BioBuilder

WHAT MAKES *BIOTECHBUILDER* DIFFERENT?

Designed for Access, Not Exclusivity

BioTechBuilder was created to reach all students by embedding biotechnology into required coursework rather than limiting participation to electives or after-school programs.

Built Around Authentic Science

Students learn through the same process scientists use every day: asking questions, designing experiments, analyzing data, and solving problems collaboratively.

Engineered for the Classroom

The program was intentionally developed to fit within existing instructional schedules and standards, making implementation practical for teachers and districts.

Grounded in Professional Learning

Teacher training is not an add-on—it is a core part of the model, ensuring educators have the knowledge and confidence to deliver modern biotechnology instruction.

Designed to Scale

By combining curriculum, laboratory experiences, and implementation support, *BioTechBuilder* enables districts to build sustainable biotechnology pathways that extend far beyond a single classroom.

Bringing Biotechnology to Every Classroom

In fall 2019, Dobyns-Bennett High School became the first school to integrate biotechnology into every freshman biology classroom.

Teachers traveled to BioBuilder's Learning Lab near MIT for intensive professional learning before returning to Tennessee equipped to deliver authentic biotechnology instruction.

With *BioTechBuilder* and Carolina's classroom-ready laboratory kits, teachers could focus on instruction instead of spending valuable time sourcing materials or designing laboratory activities. Every investigation, consumable, instructional resource, and assessment was designed to support successful implementation.

Instead of watching demonstrations or reading textbook descriptions, students performed many of the same laboratory techniques used by biotechnology professionals.

They learned to:

- Ask scientific questions
- Design experiments
- Analyze real data
- Use modern laboratory equipment
- Collaborate to solve authentic scientific problems

Teachers quickly noticed something different.

Students who had previously struggled in science became fully engaged alongside advanced learners. Curiosity replaced hesitation. Laboratory days became the most anticipated part of the course.

For many students, it was the first time science felt like something they could actually do.

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"Students at all levels—from remedial to advanced—were enjoying it so much they would ask when they got to do the next BioBuilder experiment."

—Evie LaFollette, Biology Teacher, Dobyns-Bennett High School, Kingsport, TN

Building an Ecosystem, Not Just a Program

The success of *BioTechBuilder* cannot be measured only by the number of classrooms using the curriculum.

Its true impact is the biotechnology ecosystem that emerged around it.

BioTechBuilder succeeded because organizations with different strengths committed to a common vision.

The Eastman Foundation provided the early investment to launch the initiative. BioBuilder Educational Foundation contributed its innovative curriculum and teacher professional learning. Carolina® Science provided laboratory materials, implementation support, and educator resources. East Tennessee State University strengthened teacher preparation and postsecondary pathways, while the Niswonger Foundation and participating school districts aligned to state CTE pathways and expanded the model throughout the region.

Together, these partners accomplished something larger than any one organization could have achieved independently: they built a sustainable biotechnology ecosystem that continues to grow today.

The initiative also attracted substantial additional investment from federal agencies, foundations, and higher education partners, creating laboratory infrastructure, expanded teacher training, and new opportunities for students.

Perhaps most importantly, East Tennessee demonstrated that high-quality biotechnology education is not limited to major research hubs.

With the right partnerships, rural communities can build world-class biotechnology pathways.

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"Students realize that they can do real science, not just read about it. They start to see themselves as part of something bigger."

—Wendy Courtney, STEM Specialist

KEY OUTCOMES

Expanded Access to Biotechnology
What began as a pilot at Dobyns-Bennett High School now reaches approximately **900 freshmen in BioSTEM I across seven high schools and one middle school**, with **more than 1,400 students** participating across BioSTEM I, Biology I/BioSTEM II, and BioSTEM III each year.

Built Sustainable Career Pathways
An Education Innovation and Research (EIR) grant helped establish a **four-course CTE biotechnology pathway**, creating a sustainable model for biotechnology education that is now operating across East and Northeast Tennessee.

Strengthened Student Confidence and Career Interest
In a published peer-reviewed analysis, more than **80% of participating students** reported a stronger science identity, while **88% reported increased interest in advanced science courses and life science careers** after participating in the program.

Invested in Teachers First
Initial funding from the Eastman Foundation supported professional development for educators from Dobyns-Bennett High School and East Tennessee State University, laying the foundation for successful implementation and long-term growth across the region.

Generated Lasting Regional Impact
The original investment in BioBuilder helped attract additional funding for laboratory infrastructure, teacher development, and research, creating an estimated **$100 in local economic activity for every $1 invested** in BioBuilder implementation and teacher training.

Looking Ahead

Seven years after its launch, the East Tennessee initiative has become more than a successful educational program.

It has become evidence that biotechnology education can be scaled, sustained, and transformed into a regional workforce strategy.

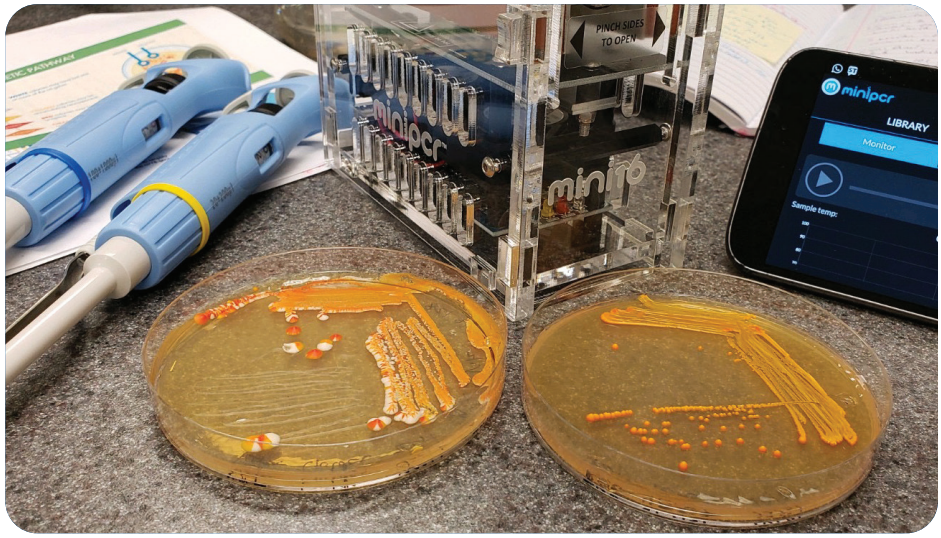
Communities across the country now look to East Tennessee as proof that students everywhere—not just those near major research universities—can participate in the future of biotechnology.

For Carolina® Science, *BioTechBuilder* represents more than curriculum and laboratory materials.

It represents a proven model for helping districts modernize science instruction while preparing students for careers that may not have existed just a generation ago.

As biotechnology continues to shape the future of medicine, manufacturing, agriculture, and environmental science, the need for authentic laboratory experiences will only continue to grow.

The East Tennessee story demonstrates that when students are given opportunities to do real science, they begin to see new possibilities for themselves—and for their communities.



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WHY IT WORKED

Proven Curriculum—*BioTechBuilder* provides standards-aligned instruction that brings authentic biotechnology into the classroom.

Ready-to-Implement Resources—Carolina's laboratory kits, instructional materials, and implementation support enable teachers to focus on student learning.

Teacher Professional Learning—Educators gain the confidence and skills needed to successfully teach modern biotechnology.

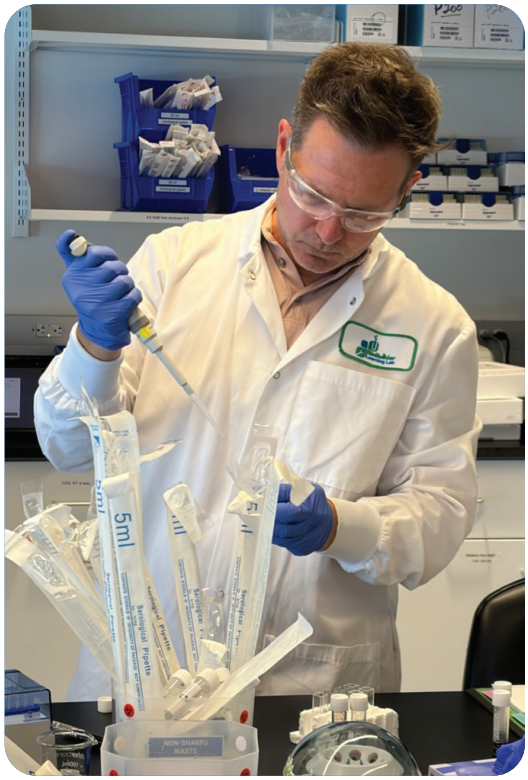
Strong Regional Partnerships—Schools, higher education, industry, and philanthropy work together to create lasting opportunities for students.

Clear Student Pathways—Students experience a seamless progression from classroom learning to college and career opportunities.

About *BioTechBuilder*

BioTechBuilder combines standards-aligned curriculum, authentic laboratory experiences, teacher professional learning, and implementation support to help schools prepare students for the future of biotechnology.

Learn more about bringing *BioTechBuilder* to your district by contacting Carolina® Science at https://knowledge.carolina.com/our-brands/biotechbuilder/.



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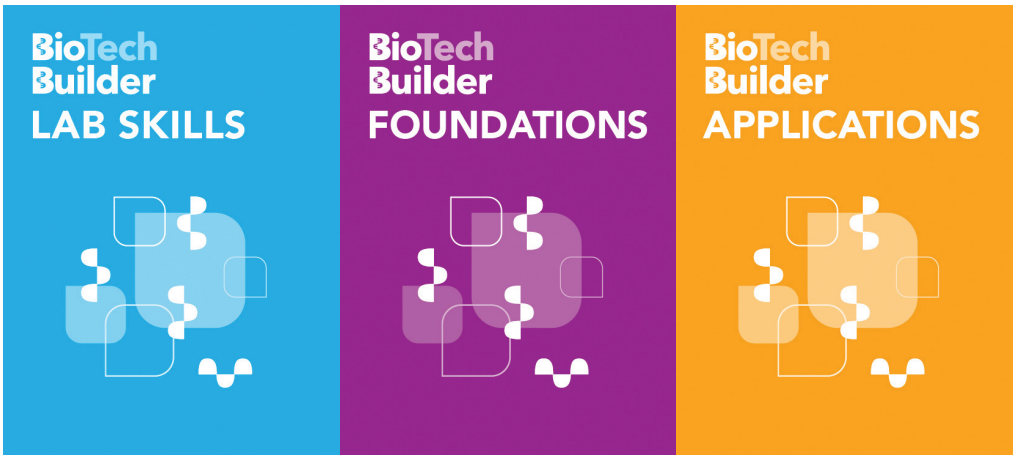
CAREER & TECHNICAL EDUCATION



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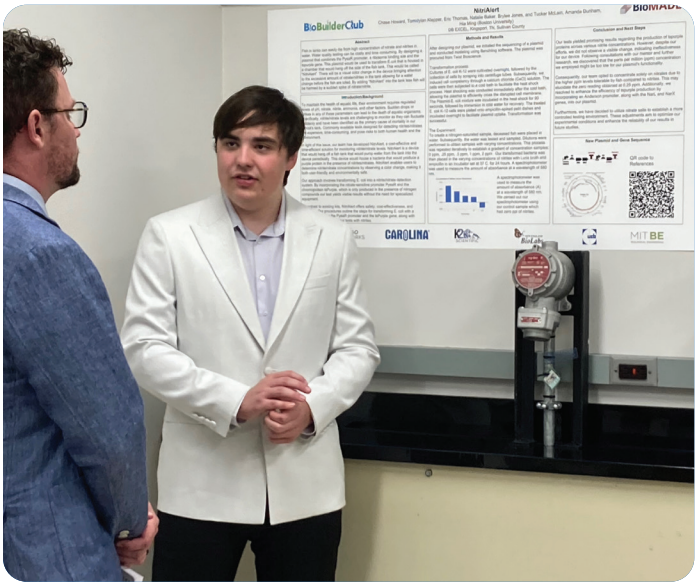

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