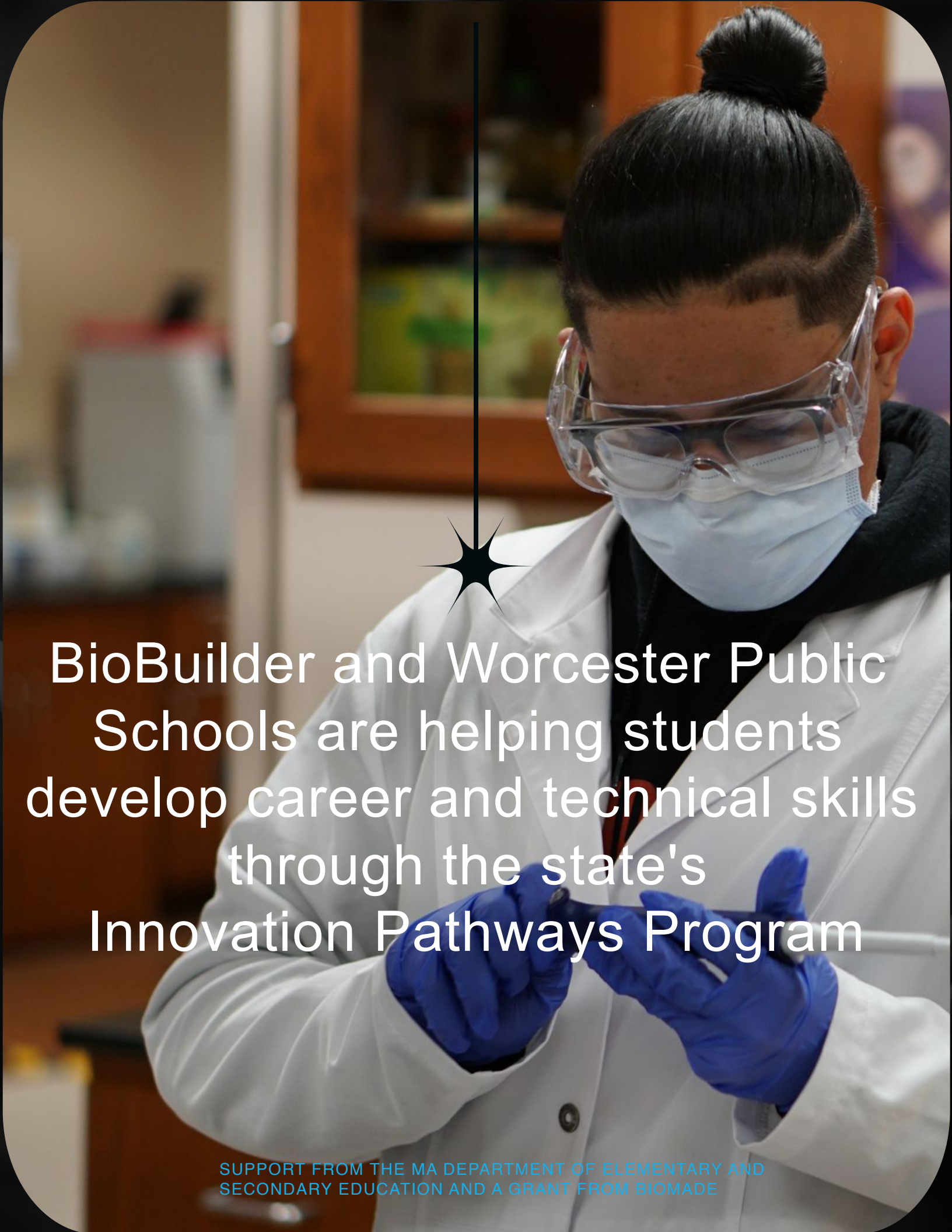




BioTechnology and BioManufacturing Certificate for High School Students

TECHNICAL COURSE 1

A student with dark hair in a bun, wearing a white lab coat, safety goggles, a light blue face mask, and blue gloves, is focused on a task in a laboratory. The background shows wooden shelves with various items. A vertical line with a starburst at the bottom is positioned over the student's face.

BioBuilder and Worcester Public Schools are helping students develop career and technical skills through the state's Innovation Pathways Program

SUPPORT FROM THE MA DEPARTMENT OF ELEMENTARY AND SECONDARY EDUCATION AND A GRANT FROM BIOMADE

BioBuilder's Innovation Pathway Workforce Training Curriculum

Technical Class 1

- ▶ Foundations of Modern Biotechnology

Technical Class 2

- ▶ Applications of Modern Biotechnology

Each class meets for 90 hours over 15 weeks, 2 sessions/week

No academic pre-requisites

Daily classroom and lab training

Additional IPP requirements

- ▶ Career and Academic Planning class all 4 years of high school
- ▶ 2 college level classes; AP or dual enrollment
- ▶ 100 hours of work-based learning (internship or capstone)

BIOTECH AND BIOMANUFACTURING CERTIFICATE



A student with dark curly hair, wearing a white lab coat, safety goggles, and a black and white polka-dot face mask, is focused on a task in a laboratory. They are wearing white gloves and holding a small, clear plastic vial. In the background, another student is partially visible, also wearing a lab coat and a black face mask. The setting appears to be a modern laboratory with various equipment and posters on the wall.

TECHNICAL CLASS 1

This foundational course familiarizes students with the technical and conceptual underpinnings of 21st century biotechnology. Students gain proficiency with essential laboratory tools and skills that are required for success in today's biotechnology industry.

▲ Knowledge

Students learn how biotechnology companies use microorganisms to make useful products, and how bio-derived products are encoded by DNA sequences.

▲ Skills

Students learn how to grow and manipulate microorganisms in ways that meet industry standards, to apply lab math to prepare, complete and analyze lab experiments, to perform molecular biology techniques such as purification and amplification of DNA, sequence analysis, and protein expression and activity measurements.

▲ Abilities

Students learn to document lab procedures and results appropriately, troubleshoot experiments in scientifically sound ways, and work safely and professionally in a life science research lab.

STUDENTS APPLY THEIR GROWING UNDERSTANDING AND DEVELOPING TECHNICAL SKILL TO A SEMESTER-LONG LAB EXPERIMENT, INTEGRATING INDUSTRY-STANDARD PROFESSIONAL PRACTICES AND WAYS OF THINKING INTO THEIR RESEARCH.

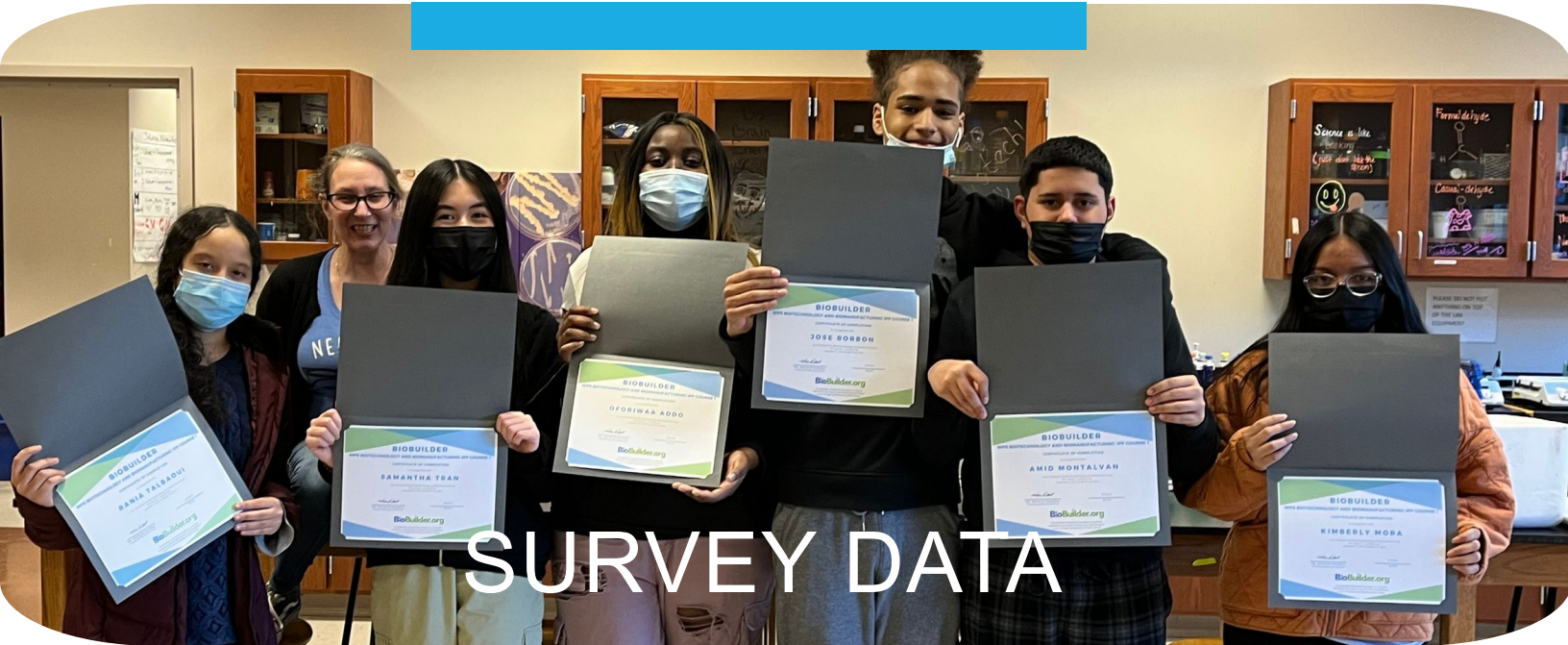
LABORATORY TRAINING INCLUDES micropipetting, sterile technique, preparation of solutions from powders, dilution of liquids, viability assay, DNA isolation, restriction digests, agarose gel electrophoresis, PCR, DNA sequencing, sequence analysis, chemical induction of bacterial cells to overproduce an enzyme, quantitative analysis of enzymatic activity, acrylamide gel electrophoresis, Bradford protein assay, Ni-NTA protein purification

PREPROFESSIONAL ACTIVITIES INCLUDE informational interviews, notebook keeping, lab math

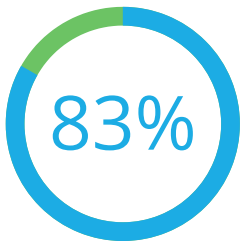
"This course has contributed to my interest of biotechnology as well as other biological related careers and subjects."

BIOTECH AND BIOMANUFACTURING CERTIFICATE





SURVEY DATA

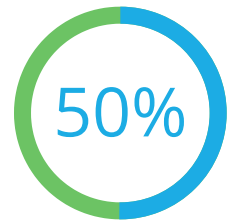


Can describe the flow of genetic information from DNA through RNA to proteins

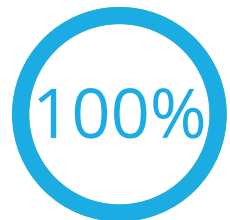


Know how to measure the concentration of bacterial cells in liquid culture

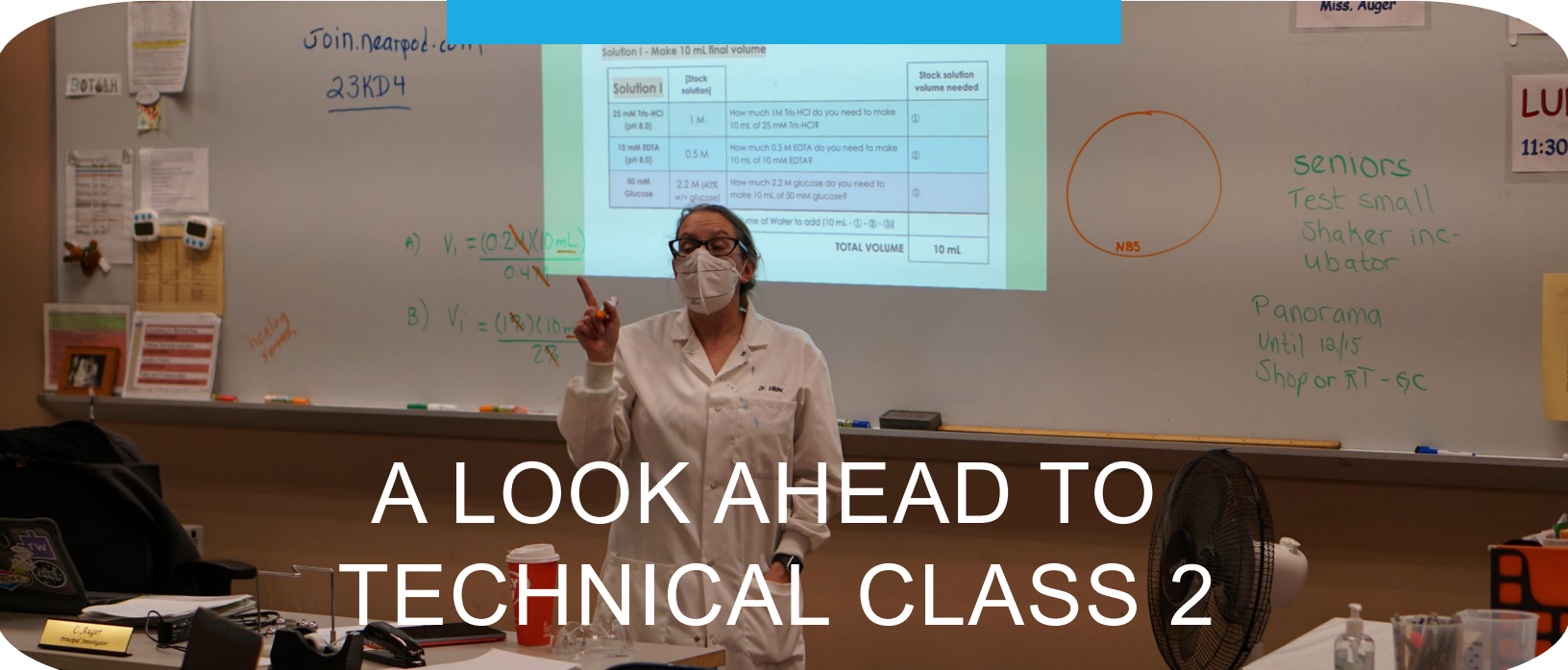
Gained confidence in their communication skills



Are more comfortable working in teams or collaborating with classmates



Agree that this course has influenced what they want to do in the future



A LOOK AHEAD TO TECHNICAL CLASS 2

Students use pre-existing laboratory modules in the BioBuilder curriculum to gain first-hand experience with the engineering design process as it applies to biotechnologies. They also use advanced biomanufacturing equipment to scale production of an enzyme produced from the micro-organism they characterized in Technical Class 1.

Knowledge

Students learn how DNA can be recoded to engineer novel living systems, and how upstream and downstream processes are integrated into GLP and cGMP environments.

Skills

Students learn how to aseptically prepare cells and media for bioreactors, scale growth volumes based on cell viability calculations, validate performance of cells in bioreactors by monitoring cell density and quantitatively analyzing relevant molecules.

Abilities

Students learn to operate, monitor, and maintain biotech equipment, tools and workstations, execute advanced laboratory protocols with precision, and collaboratively problem-solve with a project team.

BioBuilder

A young man with brown hair is wearing a white lab coat over a yellow hoodie. He is wearing clear safety goggles and blue nitrile gloves. He is focused on using a blue pipette to transfer liquid into a purple multi-well plate. The background is a blurred laboratory setting with shelves and equipment.

LEARN MORE

[https://biobuilder.org/program/
workforce-development/](https://biobuilder.org/program/workforce-development/)