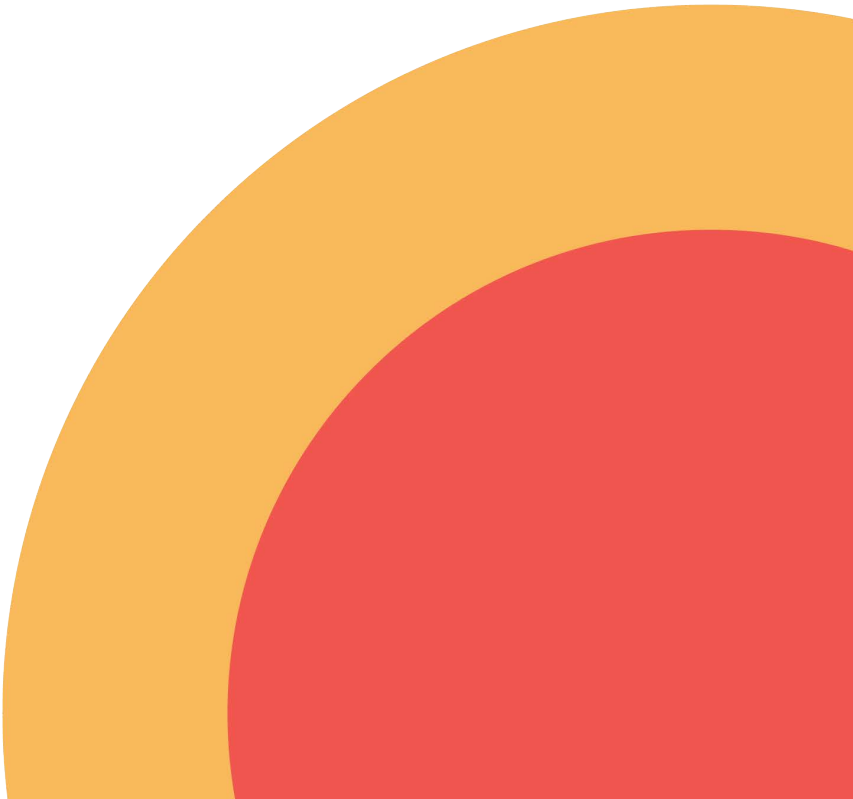
Manufacturing Skills for Connecticut:

Review of Colchester Public Schools' Bacon Academy Manufacturing Program



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Background

This program review report includes observations and key takeaways from data collected as part of the Manufacturing Skills for Connecticut (MSforCT) project and is specific to Colchester Public Schools' Bacon Academy Manufacturing Program. The report summarizes information gathered by WestEd between November 2020 and July 2021 through document reviews, surveys, and virtual site visits.

Manufacturing Skills for Connecticut Project Description [1]

Throughout Connecticut, significant gaps exist in the state's manufacturing workforce development system, most notably the dearth of comprehensive education, recruitment, and well-developed career pathways that, collectively, serve to connect industry to education. To address these issues CONNSTEP, in partnership with ReadyCT, the Connecticut Business & Industry Association (CBIA), and the Connecticut Manufacturers' Collaborative (CMC), designed the MSforCT project. The CMC includes all the major regional and statewide manufacturing member organizations across Connecticut, representing over 1200 manufacturing companies with tens of thousands of employees throughout all of Connecticut.

Funded through a grant from the U.S. Department of Commerce National Institute of Standards and Technology (NIST), the MSforCT project (2020-22) aimed to increase and improve career pathways to advanced manufacturing within the K-12 school system. To better understand which programs and models are most effective, remove the silos in which promising programs are operating, and share best practices, the project proposed to:

- complete a comprehensive inventory and analysis of manufacturing career pathway programs and initiatives across K-12 schools/districts;
- conduct program reviews of a subset of programs; and
- build a web-based repository of effective career pathway programs and key criteria for the creation of new programs. This interactive website will also serve as an online community of practice accessible to school districts, business associations, students and families, postsecondary institutions, and other stakeholders.

CONNSTEP contracted with WestEd, a nonprofit educational research, development, and service organization, to conduct the comprehensive inventory and program review. This report summarizes only a portion of the data collected during the overall project period. Specifically, this report focuses on Colchester Public Schools' Bacon Academy Manufacturing Program, one of the 13 programs selected for program reviews, and includes information collected via a state-wide online survey conducted in January 2021 and a virtual site visit conducted in May 2021.

[1] Project description adapted from ReadyCT's Manufacturing Skills for Connecticut webpage and *Manufacturing Skills for Connecticut Project Abstract*

Colchester Public Schools' Bacon Academy Manufacturing Program

Regional Information

Bacon Academy is a public high school located in the town of Colchester within New London County. Situated along the southeastern coastline of Connecticut, this region is home to a mix of urban, suburban, and rural communities, as well as submarine and advanced manufacturing industries. New London County has 285 manufacturing sector employers[2], with the Eastern Workforce Investment Board (EWIB) serving as the workforce investment board for the town of Colchester. Eastern Connecticut manufacturing jobs grew four times as fast as the rest of the state between 2015 and 2019. Two-thirds of all statewide manufacturing job growth during that period took place in the eastern region's 41 communities, ranging from Lyme to Stonington in the south to Union and Thompson in the north[3]. General Dynamics Electric Boat is one of the region's top employers. According to the most recent U.S. Census Bureau statistics, Colchester has an estimated population of 15,809, a median household income of $105,281, with 7.1% of persons living in poverty[4].

District, School, and Program Overview

Colchester School District is made up of six schools including Bacon Academy. According to data from Edsight[5], 2,322 students were enrolled in Colchester School District schools during the 2019-20 school year. The student body was majority white (85.1%) and male (51.2%). The district reported that 17.2% of its enrollees identified as students with disabilities. Additionally, 24.2% of students were eligible for free or reduced-price meals and 0.5% were English Learners (ELs). The four-year graduation rate for Colchester School District's class of 2019 was 90.3%. As reported by National Student Clearinghouse, 63% of the district's graduates enrolled in four-year institutions and 18% of students enrolled in two-year institutions in the fall immediately after high school.

The Bacon Academy Manufacturing Program began in 1980 and currently consists of a two-sequence course, totaling one and a half credits. The program recently added a third course in the 2021-22 year. Students also have the opportunity to participate in the Youth Manufacturing Pipeline Initiative (YMPI)[6] which provides manufacturing skills training to high school students who are interested in a career in manufacturing. The district has a partnership with Three Rivers Community College which allows students to be dual enrolled and receive college credits for their manufacturing courses towards an associate degree.

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[2] Connecticut Department of Labor – Employer List
[3] CBIA – Eastern Connecticut Leads State in Manufacturing Job Growth
[4] United States Census Bureau - QuickFacts
[5] Edsight - Home
[6] Eastern Connecticut Workforce Investment Board - Eastern CT Manufacturing Pipeline

Program Inventory Review

ReadyCT and WestEd worked together throughout fall 2020 to develop a comprehensive statewide inventory of K-12 Advanced Manufacturing Programs. To identify existing programs, WestEd used Google Forms and consulted with ReadyCT, the Connecticut State Department of Education (CSDE), and industry partners. At the end of the effort, the team had identified over 140 advanced manufacturing programs. A list of all programs identified can be found in Appendix A.

Survey and Site Selection Overview

WestEd researchers developed and disseminated an online survey to capture basic program data and inform the selection of programs to be reviewed.

Survey Development

The project team utilized several sources to develop a rubric to define high-quality, high-impact programs, including the Association for Career & Technical Education (ACTE)[7], the Society of Manufacturing Engineers (SME) and SME Education Foundation[8], the National Association of Manufacturers (NAM)[9], and the U.S. Department of Labor, Employment and Training Administration[10]. Survey questions were then developed to mirror the rubric and focused on five broad categories:

- Curriculum Standards and Competencies
- Business and Community Partnerships
- Career Development Offerings
- Sequencing and Articulation
- Access and Equity

Survey Dissemination

WestEd administered an online survey to manufacturing programs from February 3, 2021 through March 12, 2021. A total of 47 schools responded providing information on 51 programs, representing a 33% response rate. A list of all survey respondents can be found in Appendix B.

Site Selection

The project team used a combination of survey responses, site demographics, and industry recommendations to identify the manufacturing programs that would be invited to participate in a

[7] Association for Career & Technical Education (ACTE) - 12 Elements of a High-quality CTE Program of Study.
[8] Society of Manufacturing Engineers (SME) & SME Education Foundation - Four Pillars of Manufacturing Knowledge.
[9] National Association of Manufacturers (NAM) - NAM-endorsed Skills Certification System.
[10] U.S. Department of Labor, Employment and Training Administration - Advanced Manufacturing Competency Model.

program review of high-quality, high-impact manufacturing programs. Using the rubric created (see Appendix D) during the survey development phase, WestEd researchers scored and ranked each completed survey. A higher survey score indicated that, based on the rubric, the program was more closely aligned with elements of a high-quality, high-impact program. However, it is also important to note the limitations of this approach to identifying high-quality, high-impact programs. The primary limitations are that the programs were chosen among only a sample of manufacturing programs that completed the survey; not all surveys provided complete responses; and surveys were completed by respondents playing diverse roles with differing levels of programmatic knowledge. Thus, the sample from which the team identified high-quality, high-impact programs is limited by self-selection and the self-reported nature of the data source. It is possible that other manufacturing programs not responding to the survey are indeed high-quality and/or the programs chosen among the survey respondents provided incomplete or inaccurate information.

In addition to survey rankings, the research team considered ReadyCT's input as it further analyzed the program list. To ensure that the sample included variation, the project team considered region, urban-rural classification, and socioeconomic and diversity indexes to select a list of finalists that were eligible to participate in the program review. Finally, stakeholder feedback was incorporated into the project team's finalist list. The goal was to identify a group of sites that consisted of both programs of interest to the CMC and programs that were willing and able to participate in the evaluation. The final list of programs selected for review can be found in Appendix C.

Visit Overview

WestEd researchers conducted focus groups and interviews with stakeholders from Colchester Public Schools' Bacon Academy Manufacturing Program on May 26, 2021. Due to the ongoing coronavirus pandemic and travel restrictions, the activities were held virtually using an online video conferencing system. The purpose of the focus groups and interviews was to gather information on program characteristics and activities to supplement data captured via the survey. Additionally, the focus groups and interviews provided an opportunity to gather information from key stakeholders about program strengths and challenges and solicited recommendations. The focus groups and interviews were tailored to stakeholders' roles as outlined below.

- A focus group with three students
- A focus group with three teachers
- A focus group with the principal and a CTE department representative
- A focus group with the superintendent and director of teaching & learning
- A focus group with two business partners

Program Review Results

The sections below synthesize information gathered through the program's documents, survey response, and virtual site visit. The results are organized by the framework that most influenced the site selection rubric—the 12 areas of high-quality Career and Technical Education (CTE) that were developed by the Association for Career & Technical Education (ACTE).

Summary by 12 Areas of High-Quality CTE

Standards-aligned and Integrated Curriculum

Bacon Academy Manufacturing Program currently offers a sequence of two manufacturing courses. Manufacturing 1 is a semester-long course that serves as an introduction to manufacturing. The course covers the basics of measurement, hand tools, and how to read blueprints and dimensions. Students in this course complete projects using sheet metal and the associated tools and machines. Manufacturing 2 is a year-long course that covers more advanced concepts including advanced sheet metal working, stick welding, casting forging, and machining with mills and lathes. Although these two courses are sequential, they may be taken at any point during a student's high school career. Bacon Academy added a third course, Manufacturing Design and Production, to its manufacturing course offerings in the 2021-22 school year.

The courses are aligned with the State of Connecticut standards and CTE standards. The courses also incorporate standards from the National Institute for Metalworking Skills (NIMS) and the International Technology and Engineering Educators Associations (ITEEA). During weekly CTE team meetings, program teachers review the program components. Additionally, school leadership and business partners evaluate the curriculum regularly.

Sequencing and Articulation

Any student is eligible to enroll in the manufacturing program at Bacon Academy. On average, across all courses, there are between 100 and 120 students enrolled. The class sizes are capped at under 20 students, so each student has the opportunity to work safely with the machines and equipment in the manufacturing lab.

The program allows students to earn postsecondary credits and certifications prior to completing high school. Through the school's dual enrollment partnership with Three Rivers Community College, students successfully completing the two manufacturing courses earn college-level credit

toward their associate degree. Students may also earn a pre-apprenticeship completion certificate during their time at Bacon. EWIB also pays for students to take and receive their OSHA 10 certification. These opportunities allow students to graduate from high school with postsecondary credits and industry-recognized certificates.

Student Assessment

The manufacturing teachers at Bacon Academy focus on project-based assessments. After completing a unit, the teachers support students by providing real-time feedback while students are working on their projects. Through this process, students may incorporate changes to their projects and address errors while the projects are still in progress. These projects are supported by small quizzes throughout the course to check student understanding of materials, but the teachers shared that project-based assessments are preferred so students are able to have hands-on application of what they are learning.

Teachers described one class in which students designed a castle using Solid Works. Afterwards, students peer-reviewed one another's designs. The class then built their designs based on teacher and peer feedback. The teachers shared that they expect their students to make mistakes and use the feedback loop to allow students to improve their projects. This is also used as another form of assessment as teachers are able to see how well students problem solve and create something better. At the end of a project, students reflect on what they could do better in the future by completing a written critique. Students compile their project information and reflections throughout the course and create a portfolio to present in lieu of a final exam.

Teachers also use an employability assessment (see Appendix D). As a CTE department, the teachers developed a rubric for all their classes allowing teachers to assess students on employability skills. For example, the rubric examines whether students show up every day on time or if students are respectful in the class. Teachers grade students daily on such employability skills.

Prepared and Effective Program Staff

The three manufacturing teachers are CTE certified and hold their 047 certification through the state. The teachers meet weekly as a department to discuss a range of topics including assessment, curriculum, and lab needs. This has allowed the teachers to develop positive relationships with each other and support one another with their courses. The manufacturing teachers also regularly meet with the other teachers within the high school's CTE department including family and consumer sciences and business to discuss curriculum and potential opportunities for collaboration. Teachers attend monthly faculty meetings with the entire staff.

In addition, teachers can seek out professional development in specific topic areas. For example, one teacher attended a three-day workshop to learn how to use a CNC plasma cutter. The relationship between Bacon Academy and local community colleges gives teachers the opportunity to attend regional professional development as well. Teachers can speak with

professors at the community colleges and teachers at other schools with manufacturing programs to discuss best practices and what is happening in other classrooms across the state.

Engaging Instruction

Teachers at Bacon Academy use primarily project-based learning to teach their students. The teachers scaffold student learning to begin with basic functions of programs and simple design aspects and build into more complex functions by the end of the semester. Students are able to do hands-on applications of what they are learning in the classroom to see how the concepts they are learning apply when being used. Students work collaboratively to mirror a real-world manufacturing environment they might experience when they enter the workforce.

Access and Equity

The Bacon Academy manufacturing courses are considered elective courses that are open to all students and do not require prerequisites. Students learn about the program during their eighth-grade orientation when students first tour the high school. One teacher attends school lunch periods and introduces him/herself to the students before sharing about the courses that are being offered. In addition, teachers talk with students in the hallway between classes to build relationships.

The manufacturing program supports its students in a variety of ways. Students have access to teachers for extra help outside of class hours. Due to the block scheduling system in the school, teacher prep periods are one-and-a-half hours. During this time, students can receive additional support from teachers. English Learners (ELs) who enroll in manufacturing are often placed in the course taught by a Spanish-speaking teacher. In addition to supporting students outside of the classroom, the teachers also seat students who are high performing next to lower performing students. This allows students to give and receive peer support during class time. Finally, one interviewee noted the library will be adding manufacturing software, ideally SolidWorks, to its computers to ensure that students who are struggling can get additional help in the reading resource lab and don't have to wait until they are physically in the classroom to work on assignments.

Facilities, Equipment, Technology and Materials

Bacon Academy has invested in manufacturing facilities and equipment in order to enhance the student learning experience. The majority of equipment in the manufacturing labs is funded by the Perkins V grant. Multiple grants are written on a yearly basis to support furnishing labs with quality equipment. The administration reaches out to local businesses to determine what skills and knowledge they are looking for in applicants. In turn, this information is used when making decisions about equipment purchases for the labs. Due to the partnerships with Three Rivers Community College, the school receives additional funding. The program's equipment available to students includes Mastercam, AutoCAD, Solid Works, and Adobe Suite, as well as plasma cutting software. Students also have access to 3-D printers, welders, lathes, mills, a CNC plasma cutter, and sheet metal equipment.

Business and Community Partnerships

The principal and the CTE department representative play a large role in building and maintaining relationships with business partners in the community. The school has relationships with many companies including Sound Manufacturing, Electric Boat, and Pratt and Whitney, as well as smaller shops such as Westminster Tool. Students are able to participate in tours and attend field trips to these companies to see what manufacturing looks like in the field. This has helped form relationships between the school and business which has led to the employment of Bacon Academy graduates in these businesses.

There is a school/business partnership board that meets twice a year that allows the department representative to connect with local business partners in the CTE field. During these meetings, the representative solicits feedback on course materials as well as learns what is going on currently in the industry. These meetings usually include three to four businesses. One example of feedback they have recently received was to develop more social media marketing into the curriculum since that is becoming more valuable to the field.

Student Career Development

The teachers at Bacon Academy support students in their career development during their formal class time, and the counseling department supports students in learning about their postsecondary options. As described, teachers grade students on their employability skills. In addition, teachers take time to get to know students, learn about their interests, and help the students find information about postsecondary education and/or the workforce. As a department, the teachers expose students to as many different CTE areas as possible and, when possible, utilize personal connections to find opportunities for students outside of the school building. The teachers also help students prepare their portfolios with the different projects that they have done in their courses.

The school counseling department has planning meetings with juniors about postsecondary opportunities. There is also a counselor dedicated specifically to high school freshmen to help support them during their transition to high school and in figuring out what courses to take. The school operates under Bacon 10[11] which are 10 skills that the district expects all students to have upon graduation. These include being able to effectively communicate and contribute to the community. The school uses Naviance starting in middle school to help guide students through different pathways and how to achieve their goals.

Career and Technical Student Organizations (CTSOs)

Bacon Academy currently offers one Career and Technical Student Organization (CTSO) called DECA[12]. DECA is an organization which prepares students for careers in marketing, finance, hospitality, and management. Although this is not a manufacturing- specific CTSO, manufacturing

[11] Bacon Academy - Bacon 10
[12] DECA - High School Programs

students are still given the opportunity to participate if they are interested. Business partners interviewed suggested that Bacon Academy students participate in SkillsUSA[13], a program that may allow students to gain more manufacturing knowledge. SkillsUSA is a nonprofit organization designed to support students in preparing for careers in trade, technical, and skilled service occupations.

Work-based Learning

Students are given opportunities for work-based learning (WBL) during high school such as the opportunity to go to Electric Boat for an internship which then counts toward pre-apprenticeship hours. The teachers also utilize their personal connections with local businesses to find opportunities for students and support their postsecondary interests by helping students find information about their career options. The school also plans to hire a cooperative work educator to support WBL credit opportunities.

Data and Program Improvement

The Bacon Academy administration emphasizes continuous improvement. Currently, Bacon Academy collects data aligned with the Accountability Index[14] at the state level. This includes information about participation in courses and student outcome data. The information regarding student participation in courses allows the administration to have more data to inform annual course offering decisions. The data are analyzed during professional learning to make decisions about what changes need to be made in the coming semesters and years. The district would like to work to gather more information regarding performance assessment, including how many students achieve the program's goal of producing a piece of work by the end of the semester as well as data on students completing industry-recognized credentials. Regarding data on long term outcomes, the district has several examples of students who have completed the program and entered the manufacturing workforce, however this is currently an informal process.

Final Reflections and Takeaways

Bacon Academy has a well-established manufacturing program. Founded in 1980, the program has graduated many students who have entered the workforce or attended postsecondary educational institutions. Students can move through a sequence of courses to learn the basics of manufacturing. The program is making a continuous effort to improve the current curriculum. The staff continues to work collaboratively with one another to align the curriculum with industry standards and refine the curriculum. The project-based learning emphasis allows students to get a hands-on learning experience which allows them to gain the manufacturing and employability skills needed to enter the workforce. Students are also able to use this knowledge to explore various postsecondary options including entering the workforce or postsecondary education. Data is gathered and used to determine program needs and make it successful for future students.

[13] SkillsUSA - About
[14] CT.gov - Next Generation Accountability System

Appendix A: Inventory of CT K-12 Advanced Manufacturing Programs, by District

Ansonia School District

Ansonia High School, Ansonia, CT

Berlin School District

Berlin High School, Berlin, CT

Bolton School District

Bolton High School, Bolton, CT

Bridgeport School District

Bassick High School, Bridgeport, CT
Bridgeport Regional Vocational Aquaculture School, Bridgeport, CT
Central High School, Bridgeport, CT
Fairchild Wheeler Interdistrict Multi-Magnet High School, Bridgeport, CT
Kolbe Cathedral High School, Bridgeport, CT
Warren Harding High School, Bridgeport, CT

Bristol School District

Bristol Central High School, Bristol, CT
Bristol Eastern High School, Bristol, CT

Brookfield School District

Brookfield High School, Brookfield, CT

Capitol Region Education Council

Academy of Aerospace and Engineering, Windsor, CT

Cheshire School District

Cheshire High School, Cheshire, CT

Clinton School District

The Morgan School, Clinton, CT

Colchester School District

Bacon Academy, Colchester, CT

Connecticut Technical Education and Career System (CTECS)

A. I. Prince Technical High School, Hartford, CT
Bristol Technical Education Center, Bristol, CT
Bullard-Havens Technical High School, Bridgeport, CT
E. C. Goodwin Technical High School, New Britain, CT
Eli Whitney Technical High School, Hamden, CT
Ella T. Grasso/Southeastern Technical High, Groton, CT
Emmett O'Brien Technical High School, Ansonia, CT
H. C. Wilcox Technical High School, Meriden, CT
Harvard H. Ellis Technical High School, Danielson, CT
Henry Abbott Technical High School, Danbury, CT
Howell Cheney Technical High School, Manchester, CT
J.M. Wright Technical High School, Stamford, CT

Norwich Technical High School, Norwich, CT
Oliver Wolcott Technical High School, Torrington, CT
Platt Technical High School, Milford, CT
Vinal Technical High School, Middletown, CT
W. F. Kaynor Technical High School, Waterbury, CT
Windham Technical High School, Windham, CT

Coventry School District

Coventry High School, Coventry, CT

Cromwell School District

Cromwell High School, Cromwell, CT

Danbury School District

Danbury High School, Danbury, CT

Darien School District

Darien High School, Darien, CT

Derby School District

Derby High School, Derby, CT

East Granby School District

East Granby High School, East Granby, CT

East Haddam School District

Nathan Hale-Ray High School, Moodus, CT

East Hartford School District

East Hartford High School, East Hartford, CT
Synergy Alternative High School, East Hartford, CT
Woodland School, East Hartford, CT

East Haven School District

East Haven High School, East Haven, CT

East Lyme School District

East Lyme High School, East Lyme, CT

Eastern Connecticut Regional Educational Service Center (EASTCONN)

Quinebaug Middle College, Danielson, CT

Ellington School District

Ellington High School, Ellington, CT

Enfield School District

Enfield High School, Enfield, CT

Fairfield School District

Fairfield Ludlowe High School, Fairfield, CT
Fairfield Warde High School, Fairfield, CT

Farmington School District

Farmington High School, Farmington, CT

Glastonbury School District

Glastonbury High School, Glastonbury, CT

Granby School District

Granby Memorial High School, Granby, CT

Greenwich School District

Greenwich High School, Greenwich, CT

Griswold School District

Griswold High School, Griswold, CT

Groton School District

Robert E. Fitch High School, Groton, CT

Guilford School District

Guilford High School, Guilford, CT

Hamden School District

Hamden High School, Hamden, CT

Hartford School District

Hartford Public High School, Engineering & Green Technology Pathway, Hartford, CT

Pathways Academy of Technology & Design, East Hartford, CT

Killingly School District

Killingly High School, Killingly, CT

LEARN

Connecticut River Academy, East Hartford, CT

Lebanon School District

Lyman Memorial High School, Lebanon, CT

Ledyard School District

Ledyard High School, Ledyard, CT

Madison School District

Daniel Hand High School, Madison, CT

Manchester School District

Manchester High School, Manchester, CT

Meriden School District

Francis T. Maloney High School, Meriden, CT

Orville H. Platt High School, Meriden, CT

Middletown School District

Middletown High School, Middletown, CT

Milford School District

Joseph A. Foran High School, Milford, CT

The Academy, Milford, CT

Milford School District

Jonathan Law High School, Milford, CT

Monroe School District

Masuk High School, Monroe, CT

Montville School District

Montville High School, Oakdale, CT

New Britain School District

New Britain High School, New Britain, CT

New Canaan School District

New Canaan High School, New Canaan, CT

New Haven School District

Metropolitan Business Academy, New Haven, CT
Riverside Education Academy, New Haven, CT

New Haven School District

Engineering - Science University Magnet School, West Haven, CT
Wilbur Cross High School, New Haven, CT

New London School District

New London High School, New London, CT

Newtown School District

Newtown High School, Sandy Hook, CT

North Stonington School District

Wheeler High School, North Stonington, CT

Norwich Free Academy

Norwich Free Academy, Norwich, CT

Old Saybrook School District

Old Saybrook High School, Old Saybrook, CT

Plainfield School District

Plainfield High School, Plainfield, CT

Plainville School District

Plainville High School, Plainville, CT

Plymouth School District

Terryville High School, Terryville, CT

Portland School District

Portland High School, Portland, CT

Regional School District 1

Housatonic Valley Regional High School, Falls Village, CT

Regional School District 4

Valley Regional High School, Deep River, CT

Regional School District 5

Amity Regional High School, Woodbridge, CT

Regional School District 7

Northwestern Regional High School, Winsted, CT

Regional School District 8

RHAM High School, Hebron, CT

Regional School District 10

Lewis S. Mills High School, Burlington, CT

Regional School District 12

Shepaug Valley School, Washington, CT

Regional School District 15

Pomperaug High School, Southbury, CT

Regional School District 16

Woodland Regional High School, Beacon Falls, CT

Regional School District 17

Haddam-Killingworth High School, Higganum, CT

Regional School District 18

Lyme-Old Lyme High School, Old Lyme, CT

Regional School District 19

E. O. Smith High School, Storrs, CT

Rocky Hill School District

Rocky Hill High School, Rocky Hill, CT

Seymour School District

Seymour High School, Seymour, CT

Shelton School District

Shelton High School, Shelton, CT

Simsbury School District

Simsbury High School, Simsbury, CT

Somers School District

Somers High School, Somers, CT

South Windsor School District

South Windsor High School, South Windsor, CT

Southington School District

Southington High School, Southington, CT

Stafford School District

Stafford High School, Stafford Springs, CT

Stamford School District

The Academy of Information Technology, Stamford, CT

Stonington School District

Stonington High School, Stonington, CT

Stratford School District

Frank Scott Bunnel High School, Stratford, CT

Stratford School District

Stratford High School, Stratford, CT

Suffield School District

Suffield High School, Suffield, CT

Thomaston School District

Thomaston High School, Thomaston, CT

Thompson School District

Tourtellotte Memorial High School, North Grosvenordale, CT

Torrington School District

Torrington High School, Torrington, CT

Trumbull School District

Trumbull High School, Trumbull, CT

Unified School District #1

State of Connecticut Department of Correction, Wethersfield, CT

Vernon School District

Rockville High School, Vernon, CT

Wallingford School District

Lyman Hall High School, Wallingford, CT

Mark T. Sheehan High School, Wallingford, CT

Waterbury School District

Waterbury Career Academy, Waterbury, CT

Waterbury School District

Crosby High School, Waterbury, CT

John F. Kennedy High School, Waterbury, CT

Wilby High School, Waterbury, CT

Waterford School District

Waterford High School, Waterford, CT

Watertown School District

Watertown High School, Watertown, CT

West Hartford Public Schools

Conard High School, West Hartford, CT

William H. Hall High School, West Hartford, CT

West Haven School District

West Haven High School, West Haven, CT

Westbrook School District

Westbrook High School, Westbrook, CT

Wethersfield School District

Wethersfield High School, Wethersfield, CT

Windham School District

Windham High School, Windham, CT

Windsor School District

Windsor High School, Windsor, CT

Windsor Locks School District

Windsor Locks High School, Windsor Locks, CT

Wolcott School District

Wolcott High School, Wolcott, CT

Woodstock Academy

The Woodstock Academy, Woodstock, CT

Appendix B: CT Advanced Manufacturing Program Survey Respondents, by District

Ansonia School District
- Ansonia High School, Ansonia, CT

Bridgeport School District
- Bassick High School, Bridgeport, CT

Bristol School District
- Bristol Central High School, Bristol, CT
- Bristol Eastern High School, Bristol, CT

Cheshire School District
- Cheshire High School, Cheshire, CT

Colchester School District
- Bacon Academy, Colchester, CT

Connecticut Technical Education and Career System (CTECS)
- Bristol Technical Education Center, Bristol, CT
- Bullard-Havens Technical High School, Bridgeport, CT
- Eli Whitney Technical High School, Hamden, CT
- H. C. Wilcox Technical High School, Meriden, CT
- Harvard H. Ellis Technical High School, Danielson, CT
- Platt Technical High School, Milford, CT
- Vinal Technical High School, Middletown, CT
- W. F. Kaynor Technical High School, Waterbury, CT

Coventry School District
- Coventry High School, Coventry, CT

East Granby School District
- East Granby High School, East Granby, CT

East Haddam School District
- Nathan Hale-Ray High School, Moodus, CT

East Hartford School District
- East Hartford High School, East Hartford, CT

East Haven School District
- East Haven High School, East Haven, CT

Eastern Connecticut Regional Educational Service Center (EASTCONN)
- Quinebaug Middle College, Danielson, CT

Glastonbury School District
- Glastonbury High School, Glastonbury, CT

Griswold School District
- Griswold High School, Griswold, CT

Hamden School District
- Hamden High School, Hamden, CT

Hartford School District

HPHS Academy of Engineering & Green Technology, Hartford, CT

LEARN

Connecticut River Academy, East Hartford, CT

Lebanon School District

Lyman Memorial High School, Lebanon, CT

Madison School District

Daniel Hand High School, Madison, CT

Manchester School District

Manchester High School, Manchester, CT

New Britain School District

New Britain High School, New Britain, CT

Plainfield School District

Plainfield High School, Plainfield, CT

Plainville School District

Plainville High School, Plainville, CT

Regional School District 16

Woodland Regional High School, Beacon Falls, CT

Regional School District 8

RHAM High School, Hebron, CT

Rocky Hill School District

Rocky Hill High School, Rocky Hill, CT

South Windsor School District

South Windsor High School, South Windsor, CT

Stonington School District

Stonington High School, Stonington, CT

Suffield School District

Suffield High School, Suffield, CT

Thomaston School District

Thomaston High School, Thomaston, CT

Thompson School District

Tourtellotte Memorial High School, North Grosvenordale, CT

Torrington School District

Torrington High School, Torrington, CT

Unified School District #1

State of Connecticut Department of Correction, Wethersfield, CT

Wallingford School District

Lyman Hall High School, Wallingford, CT

Waterbury School District

Waterbury Career Academy, Waterbury, CT

West Hartford Public Schools

Conard High School, West Hartford, CT

William H. Hall High School, West Hartford, CT

Windham School District

Windham High School, Windham, CT

Windsor School District

Windsor High School, Windsor, CT

Appendix C: Final List of CT Programs Selected for Review

Bacon Academy Manufacturing at Bacon Academy Colchester School District, Colchester, CT
Bristol Manufacturing Production Pathway at Bristol Central & Bristol Eastern High Schools Bristol School District, Bristol, CT
Early College Advanced Manufacturing Program at Connecticut River Academy LEARN Regional Education Service Center, East Hartford, CT
Precision Machining Technology at Eli Whitney Technical High School Connecticut Technical Education and Career System (CTECS), Hamden, CT
Hamden Engineering Careers Academy at Hamden High School Hamden School District, Hamden, CT
Intro to Manufacturing at Lyman Hall High School Wallingford School District, Wallingford, CT
Manchester Public Schools Manufacturing Program at Manchester High School Manchester School District, Manchester, CT
Academy of Manufacturing, Engineering & Technology (MET) at New Britain High School New Britain School District, New Britain, CT
Manufacturing for Industry: YMPI with EWIB at RHAM High School Regional School District 8, Hebron, CT
Manufacturing Pathway at Tourtellotte Memorial High School Thompson School District, North Grosvenordale, CT
Precision Machining Technology at Vinal Technical High School Connecticut Technical Education and Career System (CTECS), Middletown, CT
Manufacturing Academy at Waterbury Career Academy Waterbury School District, Waterbury, CT
Career and Technical Education at Windsor High School[15] Windsor School District, Windsor, CT

[15] Windsor High School declined to participate in the program review.

Appendix D: Scoring Rubric

Category Name	Full Question	Response Required to Receive Point	Related High-quality CTE Program Element	Element-Weighted Score	Non-Weighted Score
Identified Student Populations	Has your program identified student populations in your vicinity that are typically underserved educationally or underemployed due to educational, economic or other barriers?	Yes	Access and Equity	0.3333333333	1
Identified Root Causes	Has your program identified the root causes of identified gaps in participation and performance of these student groups?	Yes	Access and Equity	0.3333333333	1
Orgs to Support Access & Equity	Has your program utilized any organizations and/or resources to support your efforts related to access and equity?	Yes	Access and Equity	0.3333333333	1
Business Partnerships	Is your program involved in any business partnerships?	Yes	Business and Community Partnerships	0.5	1
Community Partnerships	Is your program involved in any community partnerships (i.e., partnerships with nonprofit organizations, public agencies, and/or government offices)?	Yes	Business and Community Partnerships	0.5	1

Category Name	Full Question	Response Required to Receive Point	Related High-quality CTE Program Element	Element-Weighted Score	Non-Weighted Score
CTSOs	Has your school established one or more Career and Technical Student Organizations (CTSOs)?	Yes	Career and Technical Student Organizations (CTSOs)	1	1
Age: > 5 Years	Calculated age using starting year provided	> 5 Years	Data and Program Improvement	0.5	1
Program Data	Please describe the types of data the program collects and how data are used.	Response Provided	Data and Program Improvement	0.5	1
Specialized Facilities	Please describe any specialized facilities, equipment, technology, and/or materials available to program participants. Please provide any relevant website links or documentation.	Response Provided	Facilities, Equipment, Technology and Materials	1	1
Staff PD	Do program staff have opportunities to participate in professional learning activities specific to advanced manufacturing?	Yes	Prepared and Effective Program Staff	1	1
Sequenced Courses	Does the program structure require students to take courses in a SEQUENCE (e.g., Advanced Manufacturing Technology I, Advanced Manufacturing Technology II, Advanced Manufacturing Technology III, etc.)?	Yes	Sequencing and Articulation	0.3333333333	1

Category Name	Full Question	Response Required to Receive Point	Related High-quality CTE Program Element	Element-Weighted Score	Non-Weighted Score
Credentials	Which of the following industry-recognized credentials does your program offer?	At least 1 selected	Sequencing and Articulation	0.3333333333	1
Credit that Articulates	Which of the following opportunities to earn credit that articulates to the next level of education does your program offer?	At least 1 selected	Sequencing and Articulation	0.3333333333	1
Industry-Recognized Standards & Competencies	Does your program's curriculum incorporate industry-recognized technical standards and competencies (e.g., NIMS, AWS, MSSC, etc.)?	Yes	Standards-aligned and Integrated Curriculum	0.25	1
Employability Skill Standards	Does your program's curriculum incorporate employability skill standards, such as problem solving, critical thinking, teamwork, communications, interview skills, and workplace etiquette, that help students succeed in the workplace?	Yes	Standards-aligned and Integrated Curriculum	0.25	1
Publicly Available Standards	Are program standards publicly available and accessible?	Yes	Standards-aligned and Integrated Curriculum	0.25	1
Curriculum Reviewed Regularly	Is the program's curriculum reviewed regularly?	Yes	Standards-aligned and Integrated Curriculum	0.25	1

Category Name	Full Question	Response Required to Receive Point	Related High-quality CTE Program Element	Element-Weighted Score	Non-Weighted Score
Career Development	Which of the following career development opportunities does your program offer?	At least 1 selected	Student Career Development	1	1
Work-based Learning	Which of the following work-based learning opportunities does your program offer?	At least 1 selected	Work-based Learning	1	1
			Total Possible Score:	**10**	**19**

Appendix E: Employability Skills Assessment (ESA)

	Meets Goal (3)	Improving Towards Goal (2)	Does Not Meet Goal (1)	No Evidence (0)
Timeliness	Student is on time to class and ready to learn.	Student is tardy but has demonstrated improvement	Student is late or taking extended periods of leave from class.	Student is extremely late, absent, missed the majority of class or took an extended leave from class.
Engagement	Student is on task, ready to learn and is actively engaged in the classroom activities.	Student makes attempts to engage in the learning environment but needs to be frequently prompted to remain on task and engaged.	Student rarely engages in the classroom learning environment or participates in behaviors that contribute to a negative learning environment.	Student does not engage in the classroom learning environment or participates in behaviors that are negative and/or disrupt others.
Respect	Student is respectful and polite. Demonstrates respect for facility, teacher and peers. Student demonstrates behaviors and activities that promote a positive learning environment.	Student demonstrates improvement in behaviors and activities that promote a positive learning environment.	Student engages in behaviors and activities that distract from the educational learning environment.	Student does not respect the learning environment, their peers, the teacher or engages in actions that are detrimental to the well-being of the lab.

Bacon Academy Technology Education believes that every student that moves through and completes a Technology Education course leaves with the skills necessary to be employable.

With the understanding that our students choose from many career paths ranging from college, the military or going straight into the workforce after high school, it is important to us that we provide authentic and rigorous teaching that supports the development of skills necessary to obtain and maintain employment.

While we hope our students exceed these expectations and goals, this rubric and assessment are targeting the basic skills and structure needed for growth and development.

Employability Skills Assessment (ESA) version 2.0

	Meets Goal (1)	Does Not Meet Goal / No Evidence (0)
Timeliness	Student is on time to class and ready to learn.	Student is late or taking extended periods of leave from class.
Engagement	Student is on task, ready to learn and is actively engaged in the classroom activities.	Student rarely or does not engage in the classroom learning environment or participates in behaviors that contribute to a negative learning environment. Off task often.
Respect	Student is respectful and polite. Demonstrates respect for facility, teacher and peers. Student demonstrates behaviors and activities that promote a positive learning environment.	Student does not respect the learning environment, their peers, the teacher or engages in actions that are detrimental to the well-being of the lab.

Bacon Academy Technology Education believes that every student that moves through and completes a Technology Education course leaves with the skills necessary to be employable.

With the understanding that our students choose from many career paths ranging from college, the military or going straight into the workforce after high school, it is important to us that we provide authentic and rigorous teaching that supports the development of skills necessary to obtain and maintain employment.

While we hope our students exceed these expectations and goals, this rubric and assessment are targeting the basic skills and structure needed for growth and development.

Appendix F: Craftsmanship Rubric

Assessed Area	Exceeds Standard 3	Meets Standard 2	Does Not Meet Standard 1	No Attempt 0
Design & Plan	Student has a completed plan that is written and includes neat sketches/drawings complete with dimensions and descriptions.	Student has a completed plan that is complete with drawings/ sketches but lacks detail in the drawings, dimensions or descriptions.	Student has an incomplete plan that lacks drawings, sketches, dimensions and/or descriptions.	Student has made no attempt to generate a plan.
Self Assessment				
Process	Student utilizes appropriate materials, tools and technology to complete tasks. Student completes tasks in a logical and well thought out manner. Student actively utilizes their plan to complete their project.	Student utilizes appropriate materials, tools and technology to complete tasks. Student needs to improve in the areas of utilizing their plan or sequence of processes to complete project.	Student utilized appropriate materials, tools and technology to create project. Student does not utilize plan or does not follow an appropriate sequence of steps to complete project.	Student does not utilize appropriate materials, tools, and technology
Self Assessment				
Pace of Work	Student takes their time completing tasks. A focus on detail is reflected in quality workmanship.	Student meets deadlines for tasks and utilizes time appropriately each day.	Student rushes through tasks to complete project or does not utilize time appropriately to finish project before deadline.	Student makes no attempt to complete project.
Self Assessment				
Quality of Work	Student tasks/project are completed, neat, their plan is followed, and demonstrates a high level of quality and effort.	Student tasks/project are complete with a few small flaws. Student effort, and an attempt at quality is evident.	Student tasks/project are not complete. A lack of effort and/or lack of an attempt of quality is evident.	Student makes no attempt to complete a task or project that includes quality or effort.

Below please write a summary of your project, answering the following questions: 1. What did you do well? 2. What could you have improved/done differently? 3. What do you feel is a fair grade 0-100? Please give specific examples or evidence.