



MANUFACTURING WORKS

Building a Strong Manufacturing Workforce in Greater

Cleveland Phase II:

**Lessons Learned from Promising Career Technical Education
Models**

About Manufacturing Works

At Manufacturing Works, we envision a prosperous, inclusive manufacturing community in Greater Cleveland. For over 30 years our work has been a leading force to strengthen manufacturing—the foundation of our healthy neighborhoods that fuels the economy. We provide expertise and resources that assist manufacturers in understanding and adapting to fast changing trends in technology, talent, and organizational leadership. Manufacturing Works connects leaders to each other and engages them in their communities. The economic impact achieved through Manufacturing Works' efforts with these programs is felt beyond the Cleveland area. Our work resonates throughout regional and state economies. We lead, we connect, we partner. Contact 4855 W. 130th Street Cleveland, OH 44135-5137 216.588.1440

About the Authors

MJ Crocker & Associates is a consulting business founded in 2016 led by Dr. M. Judith Crocker. The organization provides services to mitigate workforce development challenges. With over 30 years of experience in workforce and education programming, the organization works with educators and employers to develop and implement solutions.

New Growth Group is a workforce consulting group that mobilizes businesses and communities to solve workforce challenges. The organization has provided strategic planning, grant and resource development, operations support, and evaluation and analytics to over 100 workforce agencies, colleges, philanthropies, and nonprofit organizations in 22 states and Washington D.C.

EXECUTIVE SUMMARY

Manufacturing Works, as a follow up to their 2018 report, "[Building a Strong Manufacturing Workforce in Greater Cleveland: Career Technical Education as an Essential Resource](#)," convened a team to research best practices and successful programs in manufacturing K-12 Career Technical Education (CTE) in urban school districts. The 2018 report concluded that although excellent manufacturing education and workforce preparation CTE programs are available throughout Greater Cleveland, the available programs are not sufficient to address the skills gap in the region.

Recognizing the challenges and significant costs such as equipment and facilities required to start a new manufacturing-related CTE program, this follow up study was launched to explore model programs that represent unique approaches to delivering CTE. It was designed to take a deeper dive into the programs identified as successful and the promising practices contributing to their success. The team looked at common characteristics of programs that had strong enrollment, high retention and completion numbers, and placement into career positions in local companies. **The goal of this project was to identify actionable promising practices in urban K-12 CTE that could potentially be considered for replication and adoption in the Greater Cleveland area.**

Three key factors consistently emerged in the more successful programs: ongoing, substantive employer involvement and support; strong, visionary leadership at the district and community level; and program instruction delivered by qualified and invested teachers. In locations where CTE was not readily accessible, unique delivery models were implemented to ensure that students could access quality CTE leading to in-demand careers.

Consistent Employer Engagement	Strong District and Community Leadership	Instructor Quality
Programs that have the best outcomes for students are those programs that find ways to meaningfully engage employers in all aspects of the program, including opening their doors for tours, hiring interns and graduates, and providing assistance with curriculum and equipment procurement.	Schools and programs with strong and visionary leaders as principals, directors, or superintendents were able to identify unique ways to use existing resources as well as accessing employer resources. Involved community leaders add value and opportunities to CTE programs.	Committed and connected instructors seek out ways to engage students in meaningful activities, providing the necessary foundational skills for the career path and demonstrating the relevance in real world settings through project-based learning and connections with employers.

While there are a number of initiatives underway in Greater Cleveland to support CTE and the manufacturing talent pipeline, there is not a targeted effort to address the critical factors to success identified through this research effort. Strong leadership, mutually-beneficial relationships between districts and employers, community involvement and a sustainable approach are required to develop and implement strategies to strengthen manufacturing talent development and create the manufacturing workforce of the future.

Manufacturing Works as a regional employer-led organization with experience working with education and training providers and other employer-led groups is well-positioned to assume a leadership role in addressing the challenges identified in this report and assisting in the implementation of unique solutions to the manufacturing workforce pipeline. Manufacturing Works has the capacity and expertise needed to successfully engage employers, educators and community leaders to develop best practices leading to successful CTE programs.

Introduction

Manufacturing Works engaged MJ Crocker and Associates (MJCA) and the New Growth Group (NG) to research best practices and successful programs in manufacturing K-12 Career Technical Education (CTE) in urban/inner-city school districts. This project builds upon the findings from their 2018 report, "[Building a Strong Manufacturing Workforce in Greater Cleveland: Career Technical Education as an Essential Resource](#)" conducted on behalf of Manufacturing Works. That review of manufacturing K-12 CTE in Cleveland and its surrounding Eastern suburbs concluded that although CTE delivers excellent manufacturing education and workforce preparation, the available programs are not sufficient to address the skills gap in the region. Common challenges such as lack of awareness about advanced manufacturing and available career paths and the industry's poor image contributed to low enrollment in many programs. Additionally, the limited number of programs offered, accessibility for the students, and the location of the schools in proximity to potential employers, impeded the effectiveness of the system.

Recognizing the challenges and significant costs such as equipment and facilities required to start a new manufacturing-related CTE program, this follow up study was launched to explore model programs that represent unique approaches to delivering CTE. This second phase of the research was designed to take a deeper dive into the programs identified as successful and the promising practices contributing to their success. The team looked at common characteristics of programs that had strong enrollment, high retention and completion numbers, and placement into career positions in local companies. They also expanded the study to look beyond northeast Ohio to other parts of the state and around the country for programs that served in urban areas and employed unique delivery strategies to meet both student and employer needs. The goal of this project was to identify actionable promising practices in urban K-12 CTE that could potentially be considered for replication and adoption in the Greater Cleveland area.

Programs determined to exemplify promising practices were closely reviewed. Interviews were conducted with key stakeholders to better understand the factors contributing to their success and a few were selected for site visits. Unfortunately, due to the impact of COVID-19 on schools, most in-person interviews and site visits were not possible. The team proceeded to complete research on key factors affecting program success, conduct some additional follow up interviews and develop recommendations and a plan.

Process and Methodology

The focus of this inquiry is to identify promising practices and key factors of success from manufacturing-focused career-technical education and training programs that could be successfully implemented in Northeast Ohio. The research team cast a wide net, digging into programs from around the state of Ohio and nationwide. Recognizing the programs considered had different implementation models the team developed a framework to develop a shared metric of quality. The framework is based on research from the Thomas P. Fordham Institute and data that emerged from the first study. This information was used to capture descriptive details about each program and identify critical factors to program success. Criteria in the framework were divided into 3 categories: Program Basics, Program Characteristics, and Connection to Employers.

- Program Basics captured identifying information about the program such as name and location, as well as common outcome measures like enrollment, retention, completion and postsecondary enrollment. For the outcome measures a rubric was used to ensure basic quality of program. Those programs that did not score at least average for the state (i.e. within the median range for graduation rate for manufacturing CTE programs statewide), were not considered further.
- Program Characteristics captured data on how the program was implemented. Here the research team dug into how the program recruited students, integration with core curriculum (English, Social Studies, etc.), and alignment with postsecondary and/or credential opportunities.
- Connection to Employers sought to quantify how deep the program's connections to employers were. The information was used to describe the program's employer engagement strategy and had measures for the number of students who had work-based learning opportunities such as internships and apprenticeships as well as those who were placed into the field immediately following graduation. Through this research process, the team identified employer connectivity, in addition to instructor quality and district/community leadership and support as critical factors to program success.

Once the framework and criteria were developed, the team presented it to the Manufacturing Works Workforce Development Board Committee. Following a brief discussion, the Committee approved the framework and criteria for this study. The team then revisited the programs included in the first study through the lens of the framework. To identify the programs for deeper analysis, the team reached out to representatives from both manufacturing and training communities to get additional perspectives on successful programs. This outreach led to a number of innovative programs from around Ohio as well as a few out of state models. With the programs identified, the research team conducted interviews with key individuals in these programs and promising practices and defining characteristics were captured. Site visits planned for early spring were cancelled due to the COVID-19 school closures.

Findings

Using the framework developed the team codified information from the interviews. The themes from the interviews are detailed below.

- Program Basics: While the program models varied, many of the program basics were fairly consistent. Given the state safety regulations for CTE and training programs for students under 18, the programs had similar class sizes. As noted above, programs that did not meet the quality rubric for outcomes were not considered. These outcomes included retention, graduation, and placement. Most of the programs were purposefully selected because they were located in urban settings and served large school districts so that results could be contextualized to Cleveland and the inner ring suburbs. It should be noted that the more non-traditional, employer-led or hosted programs were found in multi-district models that served suburban and rural students.
- Program Characteristics: Three basic structural models for CTE were identified. All are common in Ohio as well as other states. Academic courses were provided by a "home school" in two of the models (Career

Center or Compact), some comprehensive districts offer all courses in one building (Lorain High), some offer students the option to stay in the CTE school for academic programs or to return to their “home school” (Columbus Downtown High School) or some are focused on a few career pathways and students remain in that building for both CTE and academic courses (Max S. Hayes; Shaw; Cincinnati Woodward; Akron Career Academies). As noted below, Career Centers and Compacts are more likely to employ unique delivery approaches. For example, in 2019, Butler Tech leased hangar space, built learning areas and launched an Aviation Exploration Program. One program in Colorado Springs exemplified a very unique strategy to meet local workforce needs. Two districts formed a partnership, purchased a building, and acquired the necessary CTE equipment through loans from vendors and companies and purchases through their jointly established budget. Training is provided for high school CTE, as well as adult job seekers and incumbent workers in partnership with the local community college to meet the needs of the area manufacturers.

It appears that the content of the programs did not significantly impact the learning experience for the students. However, the unique delivery models and locations helped to ensure that students could access quality CTE as part of their high school experience. Strong employer involvement and influence contributed to program success, and exemplified promising practices that supported enrollment and retention. The Lake Shore compact’s use of employer and college facilities, instruction provided onsite at Pioneer Pipe, an entire new facility developed in Colorado Springs or the new Aviation Center in Middletown all required strong employer, community and district leadership and qualified instructors. The following table highlights these findings.

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CTE Model	Program Characteristics	Where Observed
<p>Traditional Career Center (Multi-District)</p>	<p>Multiple districts form legal entity to support the school</p> <p>Students transported to center for classes and returned to “home school” for academic courses. A variety of programs offered, i.e. Health Care, IT, Culinary, Mfg., Welding</p> <p><u>Unique Implementation approaches:</u> Students can be selected for pre-apprenticeship to apprenticeship program. Training delivered by CTE instructor with support of employer trainer. Students paid for work at company. Offered full time apprenticeship positions following graduation.</p> <p>Students can participate in Work Based Learning through a two week on/off full-time rotation between school and a company. Typically, two students are assigned to a company. One student in school two weeks, one at the worksite. This can be a pre-apprenticeship program. Students can transition to full time employment upon graduation.</p>	<ul style="list-style-type: none"> • Polaris Career Center https://www.polaris.edu/ • Cuyahoga Valley Career Center http://www.cvccworks.edu/ • The Career Center, Marietta and Pioneer Pipe https://www.thecareercenter.net/welding • Miami Valley Career Tech Center http://www.mvctc.com/work-based-learning • Butler Tech Career Center https://www.butlertech.org/teen-education/high-school-programs/construction-manufacturing-academy/aviation-exploration/
<p>Multi-District CTE Compact</p>	<p>Two or more districts form legal entity</p> <p>Participating schools offer one or two programs in their building.</p> <p>Member schools send students based on student interest and openings</p> <p><u>Unique Implementation approaches:</u> Students transported to employer owned facility (Lincoln Electric) or community college (Lakeland Community College) to use labs for instruction delivered by a CTE instructor.</p>	<ul style="list-style-type: none"> • West Shore Compact https://www.lakewoodcityschools.org/14/principal • Lake Shore Compact https://www.lakeshorecompact.org/
<p>One District Comprehensive High School with CTE as own CTPD</p>	<p>Large urban district.</p> <p>Offers career paths and provides all courses necessary to meet graduation requirements</p> <p><u>Unique Implementation approaches:</u> Comprehensive High School offers all academic and CTE programs. Comprehensive High School offers the option of taking all classes (academic and CTE) at school or attending only for CTE and return to home school.</p>	<ul style="list-style-type: none"> • Lorain High School https://www.lorainschools.org/CareerandTechnicalEducation.aspx • Max S. Hayes High School https://www.clevelandmetroschools.org/maxshayes • Columbus City School District https://www.ccsdoh.us/domain/201#calendar4979/20200224/month

<p>Two District Industry Learning Lab. Colorado</p>	<p>Districts partner to purchase building and create a Learning Lab.</p> <p>Students transported to lab for CTE classes and participate in academic classes in “home school”</p> <p>Other districts can purchase seats in the program and transport their students to the lab for instruction</p>	<p>Manufacturing Industry Learning Lab (MiLL) National Training Center. Col. Springs https://themillco.org/</p>
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● **Connection to Employers:** Recognizing employer engagement as a key to program success, the research team identified the different ways in which employers were participating in the studied programs. Typically, employers engage in manufacturing CTE programs in three ways: helping to align curriculum to industry needs and standards, providing experiential learning opportunities for students, and providing job opportunities for students and graduates. All of the programs studied had all three of these elements in place, however, the degree to which each program utilized employers as a resource varied. The structure of the program was one factor behind employer engagement, as some programs studied were hosted or even run by employers. Even those programs with above average outcomes had strong employer engagement practices which were deeply integrated into the program. In more traditional models, this integration looked like: curriculum that is co-created with employers, academic credit for work-based learning, and strong employment pipelines with local and regional companies. Occasionally employers provided resources such as loaned equipment, company trainers to make presentations in the classroom, and financial support for additional supplies and materials or developing content for recruitment. The support of the employer partners in promoting the career paths and providing company tours as well as their active involvement and visibility in all aspects of the CTE path increase awareness and interest from both students and parents.

Critical Factors to Program Success

After the interviews were conducted, the research team synthesized their findings. While all the programs reviewed had some unique aspects that made them stand out from others, three critical factors to program success were identified. The team found that regardless of program structure or geographical location: consistent proactive employer involvement, strong district and community leadership, and quality instructors were essential to effectively preparing students for manufacturing careers.

Consistent Employer Engagement: As noted previously, there are several ways employers contribute to CTE and training programs. The programs that have the best outcomes for students are those programs that find ways to meaningfully engage employers in all aspects of the program, from curriculum development to job placement. Employer involvement and support helped programs to implement unique delivery models including non-school based instruction. Opening their doors to the community for tours, participating in student recruitment efforts, and recognizing graduating seniors on a “Signing Day” are examples of unique approaches to supporting the school and the programs.

Strong District and Community Leadership: Schools and programs with strong and visionary leaders as principals, directors, or superintendents were able to identify unique ways to use existing resources as well as accessing employer resources. Involved community leaders add value and opportunities to CTE programs. Whether it is use of Federal or state funding or grants for instructional materials and equipment or teacher support, these leaders were constantly looking for ways to strengthen the program to improve learning and student outcomes.

Quality Instructors: Committed instructors sought out ways to engage students in meaningful activities, providing the necessary foundational skills for the career path and also demonstrating the relevance and application in real world settings through project based learning and connections with employers. Administrative support for their work created a positive learning environment where students could thrive.

Recognizing the increasing demand for skilled workers in the manufacturing industry and the opportunities that these careers offer, a number of the programs had recently implemented or planned for fall 2020 new strategies to address recruitment, enrollment, and retention issues. Once demand is confirmed by relevant local job market data, schools and their partners are becoming more proactive in developing unique ways to address the need and provide opportunities for all their students. Using a modified collective impact approach, programs that involved educators, parents, students, community leaders and employers had more success.

Programs exemplifying these factors are able to adapt to changing skill requirements and work in partnership with employers to ensure a pipeline of future skilled workers.

Key Initiatives Underway in Greater Cleveland

The implementation of Industry 4.0 and the increased use of automation and data in manufacturing technologies are changing the skills required in the workplace. Advances in flexible manufacturing, internet of things and predictive maintenance are increasing as companies implement social distancing and remote learning due to COVID 19.

Students need to be prepared to adapt and learn when faced with these changes on the job. Strong manufacturing CTE programs are more important than ever as employers require a more skilled and knowledgeable workforce prepared to address this changing environment.

Recognizing and acknowledging the ongoing skill gaps and challenges facing manufacturing in this region a number of initiatives have been launched to create unique solutions for target populations. In spite of the economic slowdown due to the pandemic, a shortage of skilled workers is projected in the coming months and the next few years.

Employer-led organizations can play a critical role in this changing environment and function as workforce intermediaries connecting the supply and demand sides of the workforce equation. These organizations often convene all stakeholders, collectively designing and implementing programs to address employers' needs and grow the workforce. In Northeast Ohio, organizations such as Manufacturing Works, MAGNET, AWT, and the Mahoning Valley Manufacturers Coalition have been engaging employers and education partners in workforce conversations for a number of years. Their efforts have resulted in programs that increase awareness about manufacturing careers, build pathways from high school to work to postsecondary education, and create candidates to fill current vacancies and participate in "earn and learn" experiences.

Manufacturing Works has supported Max S. Hayes Career High School in Cleveland for over 20 years and partnered with suburban schools and career centers connecting students with their members to increase manufacturing awareness and work-based learning experiences.

AWT members and partners in Lake County introduce students to manufacturing careers, facilitate internships and support a Robo-bots regional competition. Recently they have launched an apprenticeship program for incumbent workers and new hires and a pre-apprenticeship program for high school students.

The Mahoning Valley Manufacturers Coalition works with schools and higher ed to develop and implement pathways and work-based learning experiences leading to credentials, certificates and degrees addressing specific employer needs.

MAGNET, the Manufacturing Advocacy and Growth Network designed the Early College Early Career Program to connect non-CTE students with paid manufacturing-related work experience and courses at Cuyahoga Community College.

Currently, the Cleveland Metropolitan School (CMSD) district has a number of CTE and non-CTE manufacturing related pathway options. Max S. Hayes High School is home to the district's machining and welding CTE programs, where students can build their technical knowledge, develop skills and participate in internships through a partnership with Manufacturing Works. Additionally, CMSD students can access engineering education through Project Lead the Way at a number of high schools throughout the district as well as hands on engineering and manufacturing project-based learning experiences offered at MC2STEM, John Marshall School of Engineering and Davis Aerospace and Maritime High School. While these schools do not offer traditional CTE, students have the opportunity to pursue internships and mentoring experiences through employer partnerships.

Students throughout Greater Cleveland (ages 14-18) can participate in the Youth Technology Academy (YTA) offered by Cuyahoga Community College (Tri-C). Designed to train students for the technical workforce, this STEM-focused high school program serves over 900 students, from 18 area schools (10 of which are CMSD schools). The mission of the YTA is to ignite the interest of high school students in STEM studies and careers via robotics training, competitions, and college credit in technology courses. YTA offers students the opportunity to take college level classes in machining, robotics, and welding among other technical options.

In 2018, Cuyahoga County launched Workforce Connect, a Sector Partnership initiative to facilitate employer input and participation in developing strategies to address the workforce challenges in the in-demand industries. The Manufacturing Sector Partnership, the first to be developed, is led by the Greater Cleveland Partnership and MAGNET. Following a series of meetings with employers and key stakeholders to identify the opportunities, they partnered with Towards Employment to pilot a program to “restore” individuals returning from incarceration. Nine individuals recently completed a 4 week program and are interviewing for entry level positions. This work could result in practices that might have relevance or application to secondary CTE.

The increasing awareness among educational and community leaders regarding the benefits of CTE coupled with the recognition that many urban students may need and can benefit from learn and earn programs transitioning from high school to postsecondary, many urban districts are exploring ways to increase pathway options for their students (Columbus Downtown High School, College and Career Academies of Akron). Greater Cleveland area schools such as East Cleveland School District and the Heights Career Technical Consortium have been expanding and strengthening their manufacturing aligned pathway programs and are planning to offer manufacturing programs for their students. These programs may present an exciting new opportunity for students on the east side of Cleveland to access manufacturing education within their own home district.

Emerging Initiatives

CMUSD is looking more closely at what is currently available and how-to better address student needs and offer career opportunities. Recognizing the need to strengthen and expand current pathway offerings to better connect students who are not immediately college bound with career pathways with livable wages, CMUSD, with funding from the Cleveland Foundation, is assessing current career awareness and pathway offerings district wide and building a set of new programs and system building recommendations to address this. This effort is currently underway and has already produced a pilot program called SWAG (Student Workforce Alignment Group) to better connect students to careers after graduation. It has also allowed the district to secure the buy-in and participation from a number of key employers and organizations which is a critical factor to program success. Another potential CTE opportunity is being explored at Collinwood High School. Slated for closure due to low enrollment, the district, following community hearings, convened an employer and community led group to “re-imagine” the school with an initial focus on manufacturing education. Plans are being developed to introduce career pathways through college and CTE courses beginning in 2020-21.

Efforts to better support CTE students are bolstered through national and state policy. Federal legislation, *Strengthening Career and Technical Education for the 21st Century Act*, or Perkins V passed in 2018,

requires each state to develop the academic knowledge and technical and employability skills of secondary and postsecondary students enrolled in CTE. Ohio's plan starts with building students' career awareness and has two primary goals: to increase the percentage of graduates who are enrolled and succeeding in post-high school learning experiences, including CTE, apprenticeships, and college; and to ensure 65 percent of Ohioans ages 25-64 have postsecondary credentials leading to living wages. Through the Perkins V plan, Ohio is committed to providing all students with Work-Based Learning opportunities and access to programming to better prepare them for success. The plan offers options for the class of 2023 and beyond that include attainment of an industry credential, internships, paid work experience, remote and virtual placement, and entrepreneurship. These new opportunities will require employers and educators to work together to create project-based experiences connecting students with local companies leading to mastery of skills, career paths and higher education. Plans being implemented in Greater Cleveland could strengthen manufacturing programs.

Regional community colleges are also leading efforts to strengthen high school programs through outreach and coordinated training opportunities, including providing instruction and college credit. Led by Lorain County Community College (LCCC), Ohio TechNet (OTN) is a statewide consortium of community colleges and manufacturing employers focused on strengthening and expanding current technical education programs. Recently, six OTN colleges, including LCCC and Tri-C were awarded a Manufacturing and Engineering Education Program grant from the Office of Naval Research to expand manufacturing education statewide. A key strategy of this project is the adoption of FlexFactor, an advanced manufacturing education and career pathway recruitment program which can be implemented in middle or high school. FlexFactor connects students to local manufacturing education/training providers and employers through project-based learning experiences. The program has shown success nationwide at raising awareness of advanced manufacturing careers and building interest in manufacturing careers among female students and students of color who are traditionally underrepresented in the field.

Areas of Opportunity for Services and Pilots

While there are a number of initiatives underway in Greater Cleveland to support CTE and the manufacturing talent pipeline, there is not a targeted effort to address the critical factors to success identified through this research effort. Strong leadership, mutually-beneficial relationships between districts and employers, community involvement and a sustainable approach are required to develop and implement strategies to strengthen manufacturing talent development and create the manufacturing workforce of the future.

Manufacturing Works as a regional employer-led organization with experience working with education and training providers, is well-positioned to assume a leadership role in addressing the challenges identified in this report and assisting in the implementation of Ohio's Perkins V goals. Manufacturing Works has the capacity and expertise needed to successfully engage employers, educators and community leaders to develop best practices leading to successful CTE programs.

The CMSD Pathway Assessment process has revealed a number of opportunities for CTE support, with instructor quality presenting the most critical gap. Finding a qualified machining CTE instructor has been a challenge for the district, and is a common challenge for other CTE programs as well. The changes in manufacturing technology will require skilled instructors able to prepare students for this changing environment. One proven method to address this challenge is to deeply engage employers and industry intermediaries to identify, recruit and train potential instructors or to develop existing school staff through industry-specific professional development, training and externships.

Promoting strategies to recruit instructors and subject matter experts who are knowledgeable and skilled in applying manufacturing principles could result in not only a pool of potential instructors but also a process that could be replicated in other parts of the state. Manufacturing Works is currently developing training materials to prepare workplace mentors to successfully facilitate student transition and growth in work-based learning experiences, internships and apprenticeships. This training both in-person and virtual represents another area that could strengthen student outcomes and support the state's Perkins V goals.

The CMSD Pathway Assessment process has also found inconsistent employer engagement capacity throughout both CTE and non-CTE pathway programs offered at the district. The Friends of Max Hayes is a strong advisory group which, with support from Manufacturing Works, has helped the school build strong industry partnerships, however, this capacity does not exist district-wide. The Transformation Coordinator plays a critical role in successful employer engagement but, this capacity does not exist for every program and the Coordinator role when not dedicated to the employer liaison function can wane in effectiveness. An opportunity exists for industry intermediaries such as Manufacturing Works to provide coaching and technical assistance on effective employer engagement strategies. Additionally, some outsourced capacity to advisory group facilitation as has historically been done by Manufacturing Works with Friends of Max Hayes could help alleviate capacity strain and improve effectiveness among district and building staff.

As demonstrated in the programs reviewed in this study, leadership has to come from school and district personnel, instructional leaders and school administrators. They have to be involved to support and maintain implementation of these opportunities. Manufacturing Works could facilitate professional development to inform school leaders about manufacturing careers and opportunities for their students, ways to successfully engage with employers and implement programming in non-traditional ways when necessary. Professional Development Workshops offered in partnership with universities could be attractive to educators.

Working with their member companies, Manufacturing Works could provide leadership in developing approaches for engaging both CTE and Non-CTE students in meaningful company-based experiences. School based mentoring can increase students' and teachers' familiarity and understanding of manufacturing careers and the application of academic content in the real world. They can also help to explore ways to engage employers and students in non-traditional settings.

Conclusion

The “Building a Strong Manufacturing Workforce in Greater Cleveland” Report highlighted a number of regional assets and gaps in the region’s Career Technical Education system. Building on these findings, the research team investigated a number of quality CTE programs throughout the state and nation. While the programs studied offered a number of lessons on how to utilize partnerships and regional assets to meet the needs of students and employers, three critical factors to success were shared by all programs: consistent, sustained and mutually-beneficial employer connections; quality instruction and industry aligned curriculum; and strong district and community leadership. Many initiatives are underway throughout the region to seek to address these gaps, but they are scattered and do not address all of the challenges Cleveland and its inner ring suburbs’ districts are facing. As a recognized leader among both school districts and manufacturing employers, Manufacturing Works is well positioned to spearhead efforts related to instructor quality, building strong connections between the district and industry partners, and re-thinking CTE delivery. Recognizing this potential Manufacturing Works can champion new initiatives and help bring in new fiscal and material resources to the region to help all interested parties reach their full potential, growing manufacturing and the economy of Greater Cleveland.

