



# Advanced Manufacturing, Mechatronics, and Quality Consortium (AMMQC)

## *Final Evaluation Report*

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# EXECUTIVE SUMMARY

## I. TAACCCT Program/Intervention Description and Activities

### A. TAACCCT project and purpose

The purpose of the Advanced Manufacturing, Mechatronics, and Quality Consortium (AMMQC) initiative, launched in late 2013, was to enhance job training programs in advanced manufacturing by shifting towards a career pathways approach to training and by aligning training programs with employer demand. The AMMQC included four community colleges in four different states: Mount Wachusett Community College (MWCC) in Massachusetts, Bossier Parish Community College (BPCC) in Louisiana, North Central State College (NCSC) in Ohio, and Southwest Tennessee Community College (STCC).

### B. Description of the intervention

AMMQC aimed to transform training in the advanced manufacturing sector by incorporating career pathways components that would enable nontraditional students greater access to training and careers in middle-skill occupations and meet the needs of local and regional employers. The AMMQC model emphasized employer engagement, partner coordination, curriculum development, student support and job placement services, technology-enabled learning, and alignment of curricula with industry-recognized credentials.

#### 1. Components of the intervention

The AMMQC intervention focused on three strategies:

- **Develop and implement stacked and latticed credential and degree pathways** in the advanced manufacturing fields of mechatronics and quality control that use work-based learning, meet industry-driven competencies, have clear entry and exit points, and build on regional assets.
- **Create new online and technology-enabled courses** in the advanced manufacturing fields of mechatronics and quality control (and build on existing ones) that promote self-paced learning and allow students to develop hands-on skills.
- **Link emerging competency-based pathways** across states and colleges through new articulation agreements that facilitate access and accelerate paths toward credential attainment.

#### 2. Population served

AMMQC focused on improving access to training for nontraditional students, especially TAA-eligible individuals, veterans, and other displaced workers.

#### 3. Summarize the evidence-based or promising model the funded program/intervention used for its design, citing appropriate literature (if relevant)

In its grant application, AMMQC cited evidence showing that several of its components—sector-focused training, wraparound student services, online simulation, and the use of prior learning assessments—were associated with improved student outcomes in previous research.

## II. Evaluation Design Summary

### A. The goals of the evaluation

Overall, the evaluation aimed to understand how the TAACCCT grant and its systems-level investments in career pathways in manufacturing shaped job training for adult learners. The implementation study focused on what worked, what didn't work, and why; the impact and outcomes studies focused on how the initiative contributed to participant-, college-, and consortium-level outcomes.

## *B. Implementation study design*

### *1. Research questions*

- How did contextual factors influence the initiative's unfolding?
- What partnerships were developed and how was the project managed?
- How was each of AMMQC's major components developed and launched?

### *2. The conceptual framework for the implementation study*

Among the strengths that consortium members brought to the AMMQC initiative were their different experiences with advanced manufacturing instruction, the experience of being TAACCCT grantees in previous rounds, and their prior engagement of employer partners and their respective public workforce systems. Due to gaps in their collective strengths, they attempted to create career pathways to cover the increasing needs of industry, to provide a variety of program delivery methods to accommodate the evolving needs of students, and to articulate programs of instruction to facilitate transferability.

### *3. How the conceptual framework was used to guide the implementation analysis*

Based on existing knowledge of how career pathways initiatives are structured and AMMQC's implementation logic model, the implementation study design identified the following key components of the initiative: grant staffing; partnerships; participant recruitment and intake; student support and job placement; development of training programs and curricula; articulation and career pathways; online and technology-enabled learning; and sustainability. These key components were tracked for each of the implementing colleges to identify common themes.

### *4. Implementation data and methods*

The implementation study drew on multiple research methods including document review, semi-structured interviews, participant observation, a survey of student completers, an employer survey, and focus groups with selected students and employers. Data collection for many of these methods was carried out during a series of three annual site visits to each college in the consortium.

### *5. Measuring capacity building*

The following indicators of capacity building were identified: enhanced technology and curricula; expanded credential programs; better alignment between training programs and industry needs and standards; ability to attract students to AMMQC programs; development of stackable and latticed credential programs that are well aligned with industry needs; creation and sustainment of partnerships with employers, workforce development agencies, and regional economic development stakeholders; and likelihood to sustain grant components beyond the grant-funded period.

## *C. Discuss outcomes/ impact study design*

### *1. Research Questions*

- What were the outputs and outcomes of the initiative at the individual, college, and system levels?



- Were outcomes different for different groups of participants?
- Were there measurable differences in academic and labor market outcomes between AMMQC participants and comparison group members not served by the initiative?

## 2. Methodology

### 1. Overall methodology

For the outcomes study, descriptive analysis included tabulation of outcomes. In addition, multivariate models were used to study subgroup differences in outcomes.

For the impact study, a **difference-in-differences methodology** was utilized to estimate the impact of TAACCCT program enhancements on academic outcomes (completion). In addition, a **comparative interrupted time series** methodology was used to estimate the impact of enrolling in noncredit programs on the probability of finding employment. Both impact studies had reduced internal validity because data were not available from all participating colleges.

### 2. Data

**Multiple data sources were utilized** for the outcomes and impact studies: college administrative data; a survey of program completers; student focus groups; a survey of employers who were involved in AMMQC activities; focus groups with employers; state wage records (one college only); and Workforce Investment Act Standardized Record Data (one college only).

### 3. Outcomes and impacts measured

The following outcomes and impacts were measured: students' satisfaction with the program; employers' satisfaction with the initiative's success in providing qualified job candidates; participants' retention in academic program; completion of academic program; and students' employment status after participation.

## III. Implementation Findings

### 1. How the grant was used to build institutional capacity

- **AMMQC colleges met their enrollment targets** because they used a variety of outreach methods, enhanced partnerships with their local workforce development boards, and experimented with new recruitment strategies such as radio and television spots.
- **AMMQC colleges made progress towards career pathways development** by creating and enhancing programs (especially credit programs) that were stacked and latticed, both with one another and with other programs at the college.
- **Instructional equipment purchases** allowed colleges to incorporate more hands-on learning into the coursework, to ensure equipment was up-to-date, and to convey to students, employers, and the wider community a sense that manufacturing can be high-tech, clean, and cutting-edge.
- BPCC made substantial progress in **developing an online simulation game** that was meant to introduce students to problem solving with programmable logic controllers.
- **Some colleges developed articulation agreements** with high schools and four-year institutions to facilitate student transitions. NCSC created a new online prior learning assessment platform for the college to enable students with prior work or military experience to expedite their time to degree.

### 2. Key steps taken by the institutions to create and run training programs

- The colleges consulted with employers to understand training needs, developed new and enhanced curricula, hired instructors (many of whom had industry background), and hired staff members to provide student support.
- The colleges piloted new noncredit entry-level training programs in various formats to learn how to increase access to training for the target populations.
- The colleges updated credit curricula to keep up with industry trends and incorporate more hands-on learning opportunities into training programs.
- Two out of the four colleges implemented resume cafés and employer speed interviews that helped strengthen relationships with employers and connect students with employment opportunities.

### *3. Highlight any important partnerships*

- MWCC established partnerships with regional employer associations, generating additional exposure to employers.
- BPCC enhanced a strong partnership with Louisiana Economic Development, a state economic development agency whose mission is to attract business and investment to the state, and coordinated regional economic development activities between business and state-funded services.
- MWCC, NCSC, and STCC established partnerships with regional workforce development boards.
- NCSC established partnerships with welfare agencies and the local court system to recruit participants and better serve populations with barriers to employment.

### *4. Intervention fidelity*

Our **evaluation suggests that AMMQC successfully implemented all the elements from its scope of work**, although implementation varied from college to college (often due to factors outside the grant team's direct control).

- The components that AMMQC implemented with the highest degree of fidelity were enhanced partnerships; recruitment and intake systems; alignment of training programs with industry certifications; and purchase and utilization of new instructional equipment.
- AMMQC had more challenges implementing the following components across colleges: consistently staffing grant activities; offering consistent student support and job placement services to both credit and noncredit students; creating bridges from noncredit to credit programs (MWCC made the most progress on this); encouraging students to continue to further education; and establishing effective data tracking systems. In most cases, lower levels of fidelity were due to regional and college-level characteristics that were outside the control of grant teams.

## **IV. Participant Impacts & Outcomes**

### *1. Key outcomes and impacts estimated*

- AMMQC colleges exceeded the quantitative enrollment and completion goals they set out to accomplish during the grant period.
- Program completers who said they received assistance from grant staff members expressed high levels of satisfaction with the supports they received.



- Most participants who enrolled in noncredit programs completed them. By comparison, slightly fewer than half of the participants who enrolled in credit programs did so. Participants enrolled in certificate programs were much less likely to exit before completing their programs than those who enrolled in degree programs.
- A multivariate model of completion and retention showed that men and African-American participants were less likely to complete credit programs compared to women and other ethnic and racial groups.
- NCSC participants who began noncredit programs had substantially higher post-participation employment rates compared to Workforce Innovation and Opportunity Act (WIOA) participants from the same region who received no training. It was particularly encouraging that employment rates did not taper off after one quarter or two following participation, as is typical for brief training programs. This is particularly positive since many NCSC program participants had substantial barriers to employment (including ex-offender status, substance abuse issues, and low income). This finding suggests that employment impacts of programs that provide training and intensive wraparound staff-assisted services can be considerable for these populations.
- Enhancing credit programs at two AMMQC colleges appeared to lead to a small increase in completion rates compared to pre-enhancement programs, as measured using a comparison group of students who enrolled in programs that were similar to the enhanced TAACCCT programs in terms of length, typical student profiles, and occupational characteristics. However, the impact was statistically insignificant.

*2. Include any additional outcome and impact findings, expanding on or refining what was discussed in your evaluation plan*

- In a survey of employers who participated in AMMQC activities, more **than half of the respondents said they were strongly satisfied** with the curriculum content offered to students, about half were very satisfied with the effectiveness of the grant team promoting program graduates and the instructional equipment offered to students, and slightly more than a third of the employers surveyed felt that the regional board meetings were very productive.

*3. Note any important limitations to interpreting the findings (e.g., internal and external validity)*

- All AMMQC colleges attempted to obtain earnings data on program participants from their states' Unemployment Insurance agencies. Despite assiduous attempts, only NCSC succeeded in securing these data. This may have affected the internal validity of the impact study on labor market outcomes.
- Because career pathways systems and infrastructures built by AMMQC were still at the incipient stage, estimations of individual-level impacts may be premature.

## V. Conclusions

### A. Key lessons

- **Staffing:** Staff recruitment and retention was challenging, and it was difficult for several of the colleges to retain staff after the end of grant funding. Braiding funding from multiple sources could improve implementation and sustainability.

- **Recruitment:** Building partnerships with workforce partners and community-based organizations was critical for effective recruitment. Some colleges found that over-reliance on temporary staffing agencies for recruitment was counterproductive for the aims of the grant due to the temp agencies' lack of a career pathway orientation in their hiring processes.
- **Competing demands:** Colleges had to balance the inherent tension between meeting the needs of job seekers with barriers to employment (the college's obligation to increase access to training) and meeting employers' needs for a labor pool that they perceived as "ready to work."
- **Nontraditional students' access to training:** Although serving individuals with barriers to employment was more resource intensive, the impact study showed positive impacts on employment. This suggests that building stronger pathways between credit and noncredit programs is a promising strategy for making training more accessible to those with barriers to employment.
- **Use of technology:** Online simulation software showed promise for improving access, enhancing hands-on skills, and attracting younger generations to careers in manufacturing.
- **Lack of data management capacity and insufficient access to wage data:** Colleges generally lacked capacity for tracking participants, and three out of four colleges did not have access to wage data for verifying employment outcomes. Increasing data tracking infrastructure capacity in community colleges will be crucial for getting an accurate understanding of program impacts and outcomes. Furthermore, performance data for credit programs, in particular, were not available within the timeframe of grant activities due to the average timeline for approving new credit programs at community colleges (1–2 years) and expected average time for completion for those new programs (2–4 years for an associate degree program).
- **Employer perspectives:** Employers valued engagement with the colleges. They wanted more regular communication from colleges, more transparent information about whom to contact, and more information/marketing materials about the content of training curricula and credentials.
- **Student perspectives:** Students in focus groups expressed high levels of appreciation for the quality of instruction and support services, with several reporting improved self-confidence and higher awareness of career opportunities open to them. Students would like to see more emphasis on marketing and recruitment in the community, increased employer awareness of the credentials that students obtain, more work-based learning opportunities, and greater coordination with employers to have a foot in the door after training completion.

#### *B. Main implications for future workforce and education research*

- **Alignment of expected timelines for implementation with performance measurement:** Career pathways development is a complex endeavor that requires considerable time to complete, especially for the development and approval of new credit curricula. Follow-up research is necessary to fully understand the impacts of TAACCCT-funded initiatives; it was not possible to capture this within the timeframe of the grant.
- **Sustained systems-level investments:** Due to the complexity of implementing and staffing career pathways initiatives, future investments in career pathways should consider more sustained investments. Only toward the end of the grant period did colleges see increased word of mouth and greater awareness in local communities of the programs available.

- **Enhanced tracking of student support services:** Better tracking of service dosage and employment outcomes will be necessary in future research to be able to more comprehensively understand the impacts of support services on the outcomes of nontraditional students. In addition, better tracking of students as they progress through career pathways (e.g., from noncredit to credit over a longer timeframe) would enable more sophisticated analyses of participant-level outcomes of career pathways initiatives.



## CHAPTER 1: INTRODUCTION

Since the global economic recession of 2007–2009, some manufacturing fields in the U.S. have started to rebound from a long-term pattern of decline. The growth has largely occurred in technologically advanced sectors. Significant technological changes—such as the rise of automated production—are a key driver of this new growth in manufacturing, which some observers are calling the “third industrial revolution.”<sup>1</sup> While jobs operating these new technologies may not necessarily require a college degree, they do require more familiarity with basic computer programming and a wider set of production skills than the entry-level and mid-level manufacturing jobs of the past. Many experienced manufacturing workers lack these skills—and others are retiring—resulting in increased labor demand. Employers’ needs, however, are not being fully met by the pipeline of new jobseekers who have completed the relevant skills training in high schools, technical schools, and community colleges.

As a result, there is a shortage of labor available to perform the middle-skill manufacturing jobs that are increasingly in demand. In advanced manufacturing, the occupations in high demand are in fields such as computerized numerical control (CNC) machining (which may involve 3-D printing technologies), automated production (which combines mechanical and electronic technology and is often called mechatronics), machine maintenance and security, and robotic welding. Although aggregate estimates of the magnitude of this labor shortage are not easy to compute, and analysts disagree about the accuracy of the estimates that do exist,<sup>2</sup> a national study in 2011 found “a significant gap between the talent [manufacturers] need to keep growing their businesses and what they can actually find.”<sup>3</sup> Additionally, the study reported that manufacturers have the most difficulty filling positions that require the highest levels of skill. Other research has highlighted the likelihood of future manufacturing employee shortages caused by the retirement of older workers, and the fact that many of their positions will need to be filled by skilled individuals.<sup>4</sup>

Many experienced manufacturing workers who were displaced during the recession are currently underemployed or unemployed; retraining them has been a challenge for several reasons. Many of those who have been unemployed for a long time need to address other pressing needs—such as finding housing, arranging reliable transportation, or arranging and paying for childcare—before they can be successful in training or a job. Recruiting new manufacturing workers has been hampered by a low level of awareness of manufacturing career paths and a low opinion of manufacturing jobs resulting from the previous decades of economic decline in the sector. Both factors have led to difficulty recruiting students for manufacturing training programs.

The career pathways model, which emerged in the late 1990s as a system-based solution to labor market misalignments, has been viewed as a potential solution to these retraining challenges because it aligns training with industry demand and is designed to meet the complex needs of adult learners. Career pathways systems include clearly specified sequences, or pathways, of education coursework and/or training credentials carefully aligned with the competencies employers say they need. Career pathways programs are intended to provide industry-recognized credentials, to make it easier for people to learn in a flexible manner (such as by completing short-term training modules that result in stackable credentials), to provide students with marketable skills so that they can find work in promising

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<sup>1</sup> Kochan et al. (2012); Liu and Grusky (2013)

<sup>2</sup> Osterman (2014)

<sup>3</sup> Morrison et al. (2011)

<sup>4</sup> Eyster, Anderson, & Durham (2013)

careers, and to increase opportunities to “learn and earn” at the same time.<sup>5</sup> Career pathways systems often include, in addition to training, case management, intensive advising, and student supportive services. These features of career pathways systems are particularly well suited to meet the needs of working learners and nontraditional students. Because of all these interlocking features, designing and implementing an effective career pathways model for advanced manufacturing—one that produces graduates with adequate skills for the jobs required by industry—requires participation by an array of organizational entities, including state and local public agencies, private and nonprofit organizations, and employers representing different sectors in the economy.

The Advanced Manufacturing, Mechatronics, and Quality Consortium (AMMQC) initiative, launched in late 2013, used a career pathways model to expand job training programs in advanced manufacturing in four community colleges in four different states. Funding for AMMQC came from the U.S. Department of Labor (USDOL) through a Round 3 Trade Adjustment Assistance Community College Career Training (TAACCCT) grant awarded in 2013. The four community colleges making up the consortium were the following: Mount Wachusett Community College (MWCC) in Massachusetts, Bossier Parish Community College (BPCC) in Louisiana, North Central State College (NCSC) in Ohio, and Southwest Tennessee Community College (STCC). The overarching goal of the initiative was to better serve the training needs of displaced workers (and other adult learners) by transforming educational delivery methods and accelerating skill development and credential attainment in the advanced manufacturing fields of mechatronics, metrology, and quality control at the four colleges.<sup>6</sup>

USDOL required that all TAACCCT grantees, including AMMQC, use some of their grant funds to commission third-party evaluations of their initiatives to support continuous improvement and evidence-based policymaking. The present report fulfills that requirement for the AMMQC initiative and in addition provides a cross-site analysis of project implementation, a snapshot of student and employer perspectives, a summary of outcomes and impacts of TAACCCT-funded program participants, and a synthesis of lessons learned and practices with promising future application. Ultimately, the evaluation aims to contribute to current thinking on the role of career pathways in alleviating labor market imbalances in advanced manufacturing.

This chapter offers the background information needed to understand and interpret the material presented in subsequent chapters. It begins by presenting the TAACCCT grant program and its goals. This section is followed by another that introduces the colleges that participated in the consortium and describes the varying economic contexts of each college’s local region. The next section describes the AMMQC initiative and presents the logic model that underpins its design. The penultimate section describes SPR’s approach to the evaluation and includes a summary of research questions and methods. The chapter concludes with an explanation of how the report is structured.

## Background on the TAACCCT Grant Program

Before the launching of TAACCCT, career pathways initiatives were both relatively rare and relatively understudied. No rigorous studies evaluating whole career pathway systems existed, although the efficacy of specific elements of career pathways had been established by prior research. For example, a

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<sup>5</sup> [https://careerpathways.workforcegps.org/resources/2016/10/20/10/11/Enhanced\\_Career\\_Pathways\\_Toolkit](https://careerpathways.workforcegps.org/resources/2016/10/20/10/11/Enhanced_Career_Pathways_Toolkit)

<sup>6</sup> Mechatronics blends elements from mechanical engineering, electrical engineering, and computer science to design devices that use technology in the manufacturing process (Vaughan et al., 2008). Metrology and quality deal with precise measurements, using computers and special tools to make products and improve manufacturing techniques.



rigorous random assignment evaluation of Career Academies – small learning communities within high schools that target specific economic sectors for which students receive training and part-time employment, as well as other services – found large impacts on earnings, especially for at-risk young men, which persisted after high school.<sup>7</sup> At the postsecondary level, demonstration efforts had shown that several approaches – including learning communities, mandatory counseling sessions, and merit-based financial aid – were capable of increasing course completion and credit attainment among low-income students enrolled in community colleges.<sup>8</sup> Further, programs that combined remedial and occupational training, like I-BEST in Washington State, had been shown to lead to better educational outcomes for their participants compared to similar students who did not participate.<sup>9</sup> And “sectoral” training programs, in which intermediaries work with employers in a particular sector to generate training for jobs in that sector and provide support services for the disadvantaged, had been shown to generate large positive impacts for participants.<sup>10</sup>

The TAACCCT initiative responded to labor supply imbalances in advanced manufacturing, healthcare, information technology, energy, transportation, and other sectors by creating what was arguably the largest career pathways-building laboratory to date. It supported community college development of new education and career training program strategies or enhancement of existing ones using evidence-based information, in a way that would meet employer demand for a skilled workforce and would help workers who have lost their jobs (because of foreign trade or other economic factors) prepare for employment in growing industries.

TAACCCT was rooted in a few core principles. First, USDOL specifically emphasized the intent of TAACCCT grants to promote the building of career pathways, as evidenced by two of the program’s core elements—stacked and latticed credentials and articulation and transferability of credit. Second, USDOL encouraged community colleges to use TAACCCT funds to develop and test innovative programs with the intention of selecting practices that were proven effective, thus stressing the experimental nature of the initiative. Third, TAACCCT-funded initiatives were primarily capacity-building exercises meant to improve the colleges’ “capacity to implement innovative educational programs that meet the needs of workers and employers.”<sup>11</sup> In other words, although the hope was that TAACCCT-funded projects would benefit individual jobseekers and companies, the primary goal was to help community colleges build an organizational infrastructure capable of sustaining career pathways opportunities for future students.

## The Consortium Colleges and Their Regions

Most TAACCCT grantees operated within a single, well-defined geographic area. AMMQC was unusual in being made up of grantees in four different regions with very different economic contexts. Exhibit 1-1 below shows the locations of the consortium colleges and their respective local regions. To maintain consistency, we have defined the region as the set of counties within a 50-mile radius of each college.<sup>12</sup>

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<sup>7</sup> Kemple (2008)

<sup>8</sup> Richburg-Hayes et al (2013); Brock (2010)

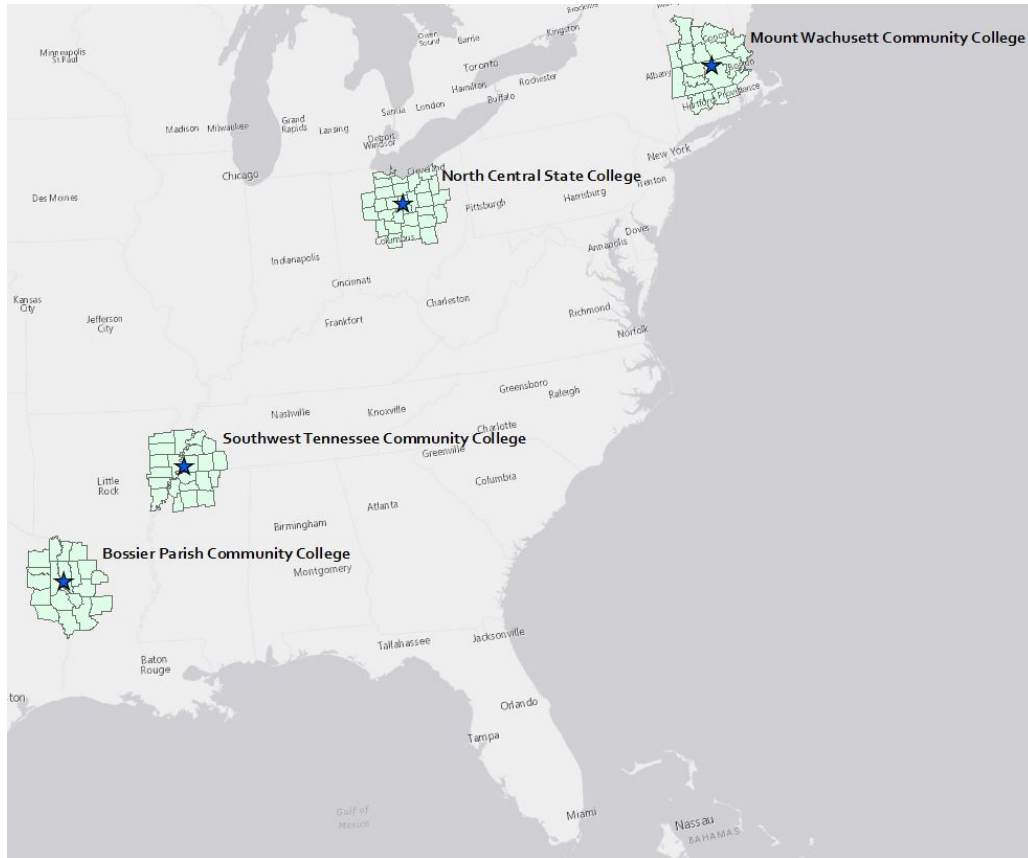
<sup>9</sup> Jenkins et al. (2009)

<sup>10</sup> Osterman (2007), Maguire et al. (2010), Roder and Elliott (2011).

<sup>11</sup> SGA/DFA PY 12-10, Round 3 Trade Adjustment Assistance Community College and Career Training Grants Program SGA, [https://www.doleta.gov/grants/pdf/taaccct\\_sga\\_dfa\\_py\\_12\\_10.pdf](https://www.doleta.gov/grants/pdf/taaccct_sga_dfa_py_12_10.pdf)

<sup>12</sup> Several of the colleges were located very close to state borders, and the Local Workforce Development Areas and college services areas were confined only to the state the college was located in. Practically speaking, however, labor markets for a college can easily cross state lines, so we chose 50 miles as a reasonable commuting

**Exhibit 1-1: Map of AMMQC Colleges and the Counties within a 50-mile Radius of each College**



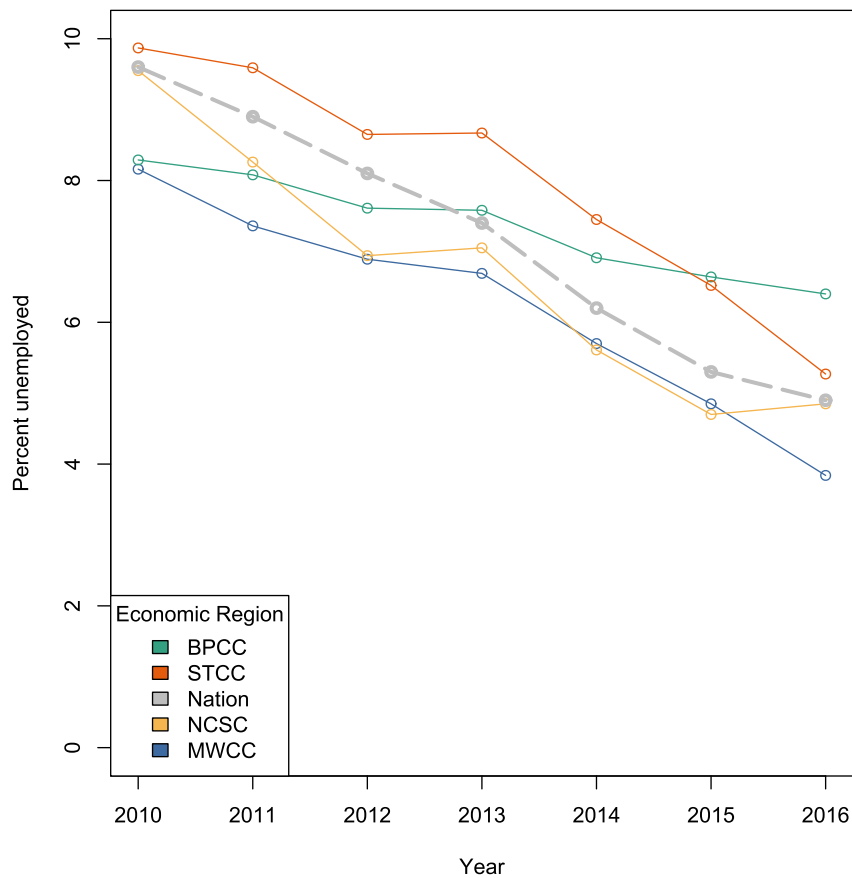
With each college located in a different part of the U.S., the colleges as a group exhibit sizable differences in overall economic conditions and in the size and relative importance of their local manufacturing sectors.

**Variations in Regional Unemployment Rates.** When the AMMQC initiative was in the planning stages in 2012–2013, the U.S. was still recovering from the global economic recession of 2007–2009. Since that time, the national economy has consistently improved, but unemployment rates have varied considerably from one region to the next. At the beginning of the study period, the regions around STCC and NCSC had average annual unemployment rates approaching 10 percent, while the regions around BPCC and MWCC faced unemployment levels of slightly over 8 percent (see Exhibit 1-2). During the study period, however, the rate of unemployment improved most slowly in the BPCC region, leaving this region with the highest level of unemployment at the end of the study period. The region with the lowest unemployment level at the end of the study period was MWCC.

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distance from each college (this is also consistent with the moving distance required to qualify for relocation assistance under the Workforce Innovation and Opportunity Act).

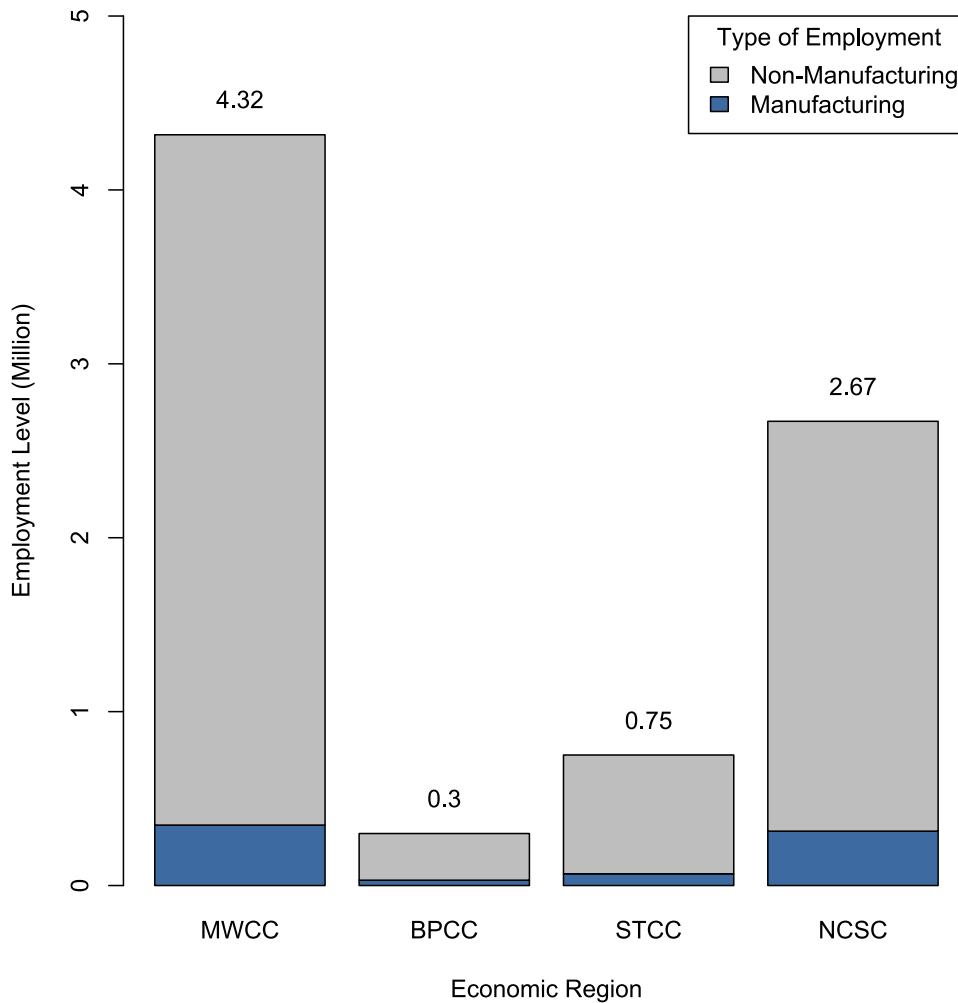
**Exhibit 1-2: Average Annual Unemployment Rates, 2010-2016**



Source: Bureau of Labor Statistics, Local Area Unemployment Statistics, 2017

**Variations in the Size of the Regional Economy and the Relative Importance of the Manufacturing Sector.** In addition, the regions are quite different from each other regarding the size of the manufacturing base relative to other industry sectors and the absolute number of jobs available in manufacturing within a 50-mile radius of the college. Although manufacturing accounts for a relatively small proportion of all employment across all regions, the MWCC and NCSC regions have significantly higher numbers of jobs overall as well as the highest number of regional manufacturing jobs (Exhibit 1-3). In the case of both regions, there are major urban areas within 50 miles from the college—Boston for MWCC and Cleveland and Columbus for NCSC. The BPCC region has the fewest number of jobs and manufacturing jobs among the four college regions, in addition to having the highest regional rate of unemployment in 2016 (see Exhibit 1-3).

**Exhibit 1-3: Annual Averages of Monthly Employment Levels in the Four Economic Regions, 2016**



Source: Bureau of Labor Statistics, Quarterly Census of Employment and Wages. The region includes all counties within 50 miles of the college.

Grant staff members interviewed for the study confirmed the regional differences and the trends mentioned above. According to our respondents, advanced manufacturing was resurging in the Bossier City, LA (BPCC) area before the start of the grant after several years of decline, particularly in response to the growth of the oil and gas industry, but by the end of the grant this area was growing much more slowly than any other region (due to declines in the same sector). STCC's catchment area (Memphis, TN) had historically been better known for logistics than for manufacturing. By contrast, manufacturing had long been an important industry in both the Central Massachusetts region (MWCC) and the North Central Ohio (NCSC) area. However, these two regions also have striking contrasts: Central Massachusetts, where MWCC is located, is a thriving region with growing employment and advanced manufacturing employers in almost every subsector,<sup>13</sup> whereas the NCSC area is dominated by small traditional manufacturers that use older production techniques.

<sup>13</sup> Renski & Wallace (2014).

## The Consortium and AMMQC Initiative

As described above, the four colleges formed the consortium to develop an initiative that would

- (1) enhance how manufacturing training programs were structured and delivered to better meet the needs of adult learners; and
- (2) better align the training with the skill sets that employers needed in advanced manufacturing.

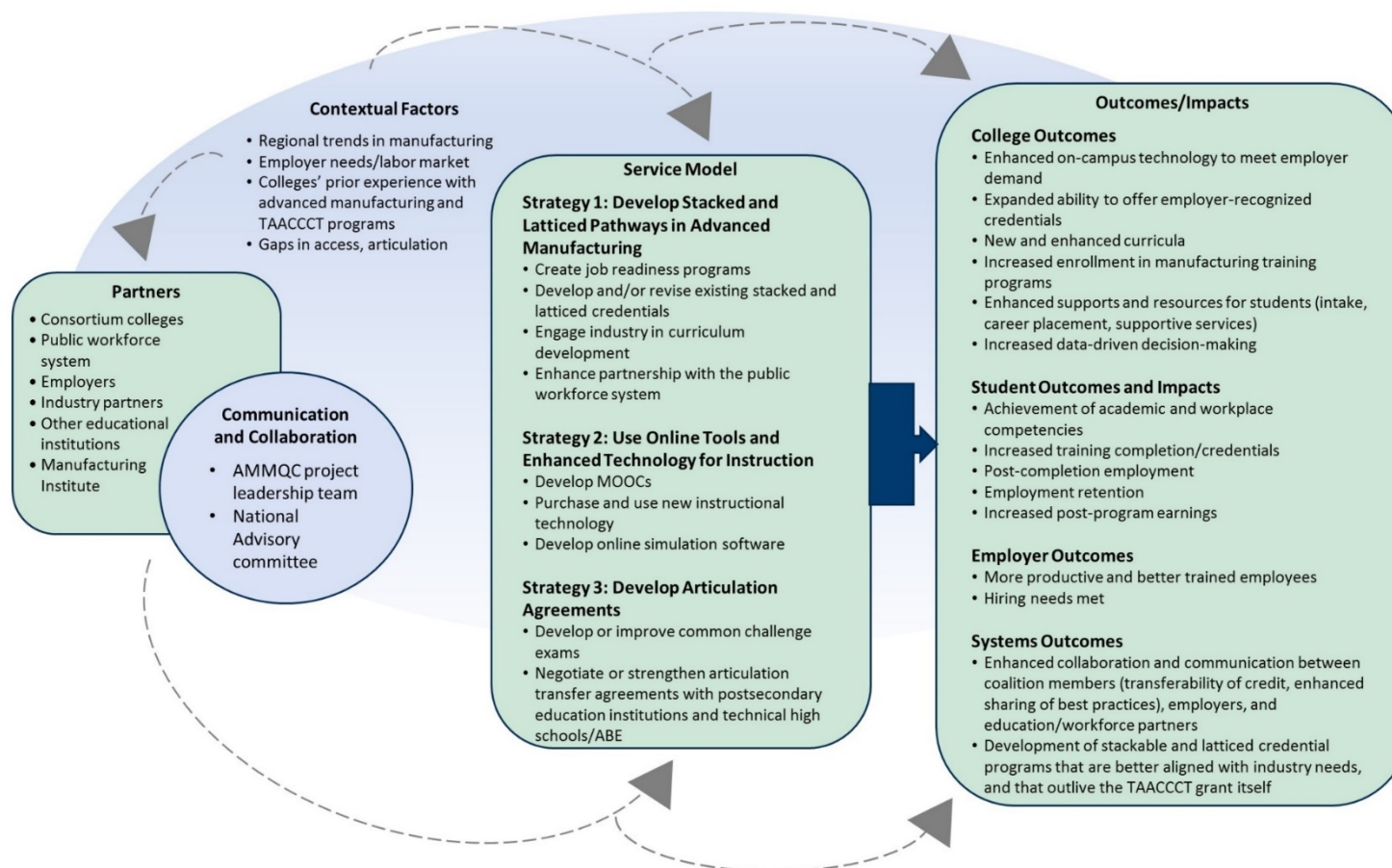
The consortium structure was seen as a way for the colleges to share their respective strengths, following a Centers of Excellence model. Each college brought to the consortium unique expertise in specific fields, and it was hoped that that expertise would be leveraged to create and implement stacked and latticed credentials in these specific fields and that these would be shared across all four colleges.

AMMQC aimed to transform training in the advanced manufacturing fields by incorporating three main strategies into the initiative:


- **Develop and implement stacked and latticed credential and degree pathways** in the advanced manufacturing fields of mechatronics and quality control that use work-based learning, meet industry-driven competencies, have clear entry and exit points, and use regional strengths.
- **Create new online and technology-enabled courses** and credentials in the advanced manufacturing fields of mechatronics and quality control (and build on existing ones) that allow students to build hands-on skills while promoting self-paced learning.
- **Link emerging competency-based pathways** across states and colleges through new articulation agreements that facilitate access and accelerate paths toward credential attainment.

The logic model presented in Exhibit 1-4 below provides an overview of the initiative. It shows the relationships among the core partners, the program model, and the anticipated outcomes and impacts. This logic model acknowledges contextual factors that could have influenced implementation and outcomes, such as regional trends in manufacturing, labor market conditions, and strengths or gaps in the ability of each college to implement the core grant strategies.

**Exhibit 1-4: AMMQC Initiative Logic Model**







Among the strengths that consortium members brought to the AMMQC initiative were their different experiences with advanced manufacturing instruction, the experience of being a Round 1 TAACCCT grantee, and their prior engagement of employer partners, the Manufacturing Institute,<sup>14</sup> and their respective public workforce systems. Due to gaps in their collective strengths, they needed to create career pathways to cover the increasing needs of industry, to provide a variety of program delivery methods to accommodate evolving needs of students, and to articulate programs of instruction to facilitate transferability.

The left side of the logic model shows the partners that were central players in the initiative's implementation. These partners included member colleges, other colleges with which consortium members might develop articulation agreements, the public workforce development system, industry partners, and employers. The model also shows the primary vehicles for partner communication and collaboration, which included the AMMQC leadership team and the national advisory board.

The middle panel of the logic model shows the three key components of the initiative (mentioned above), which map onto the AMMQC work plan.

The far right of the logic model shows potential outcomes at the college, student, employer, and systems levels. At the college level, potential outcomes included enhanced technology and curricula, expanded credential programs, and better alignment between training programs and industry needs and standards. At the student level, potential outcomes included completion of relevant credentials, expedited pathways to certificates and degrees, and improved job prospects upon program completion. At the employer level, potential outcomes included decreased time needed to fill vacant positions with qualified workers, improved work performance, and, ultimately, increased profitability. At the systems level, potential outcomes included the development of stackable and latticed credential programs that are better aligned with industry needs and are sustained beyond the grant-funded period.

## Overview of the Evaluation

SPR's evaluation included an implementation study, an outcomes study, and an impact study. The purpose of the evaluation was to address the following overarching research questions:

- (1) How did the TAACCCT grant and its systems-level investments in career pathways in manufacturing shape job training for adult learners? In other words, what worked, what didn't work, and why?
- (2) How did the initiative contribute to the participant-level, college-level, and consortium-level outcomes that were observed?

More specific research questions for each study are summarized in Exhibit 1-5 below:

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<sup>14</sup> An affiliate of the National Association of Manufacturers (NAM) that was hired by AMMQC to promote career pathways development by mapping AMMQC programs to the NAM-endorsed Skills Certifications System.

**Exhibit 1-5: Main Research Questions for Each Study**

Evaluation Component	Research Questions
Implementation Study	<ul style="list-style-type: none"><li>• How did contextual factors influence the initiative’s unfolding?</li><li>• What partnerships were developed and how was the project managed?</li><li>• How was each of AMMQC’s major components developed and launched?</li></ul>
Outcomes Study	<ul style="list-style-type: none"><li>• What were the outputs and outcomes of the initiative at the individual, college, and system levels?</li><li>• Were outcomes different for different groups of participants?</li></ul>
Impact Study	<ul style="list-style-type: none"><li>• Were there measurable differences in educational and labor market outcomes between TAACCCT participants and comparison group members?</li></ul>

The implementation study drew on multiple research methods, including document review, semi-structured interviews, participant observation, a survey of student completers, a survey of companies involved in AMMQC activities, and focus groups with students and employers. SPR conducted three rounds of site visits to carry out data collection for several of these methods.

For the outcomes study, SPR drew from the data systems of participating colleges to measure the main outputs and outcomes of the initiative, including the number of students who enrolled, the number who completed a grant-funded program of study, the number who earned a degree or a certificate (by type), the number who were retained in their program, and post-program employment and earnings.

Due to the challenges of using a random assignment-based experimental design, SPR opted for a quasi-experimental approach to estimate program impacts. This design compared the outcomes of program participants with those of comparison groups of individuals who received no services from the intervention being studied. To build comparison groups, SPR identified similar students from each participating college, utilizing college record systems as well as publicly available workforce development data, as described in detail in Chapter 8.

## Overview of This Report

The report is divided into three sections: Part 1 focuses on the implementation study results, Part 2 contains findings from the outcome and impact studies, and Part 3 contains a synthesis of findings and identifies promising practices.

**Part 1.** Chapter 2 introduces the implementation study, the intended service model and implementation approach, the implementation study questions, and the research methods (in more detail). It summarizes how the consortium implemented consortium-level activities during the grant period.

Chapters 3, 4, 5, and 6 describe each college's implementation results, situating implementation within the unique context of each college. This case-study approach was chosen because of the substantial variation in the economic and institutional context of each college. The key strength of this case study approach (relative to describing results by theme or area across the colleges) is that it reduces the risk of false comparisons.

The main objective of Part 1, the implementation study section of the report, is to shed light on how well the initiative aligned with the intended program model when it was implemented in practice. Part 1 also establishes an empirical foundation that is essential for understanding the findings from the outcomes and impact studies.

**Part 2.** Chapters 7 and 8 present the findings from the outcome and impact studies respectively. Chapter 7 leverages data obtained from a wide array of quantitative and qualitative sources to describe the main outcomes of the initiative at the individual, college, and employer levels. Chapter 8 attempts to estimate the impact of participating in AMMQC-funded activities at the individual level.

**Part 3.** Chapter 9 utilizes findings presented in previous chapters to synthesize the main findings across the evaluation and to identify promising practices and lessons learned from the evaluation of AMMQC. The chapter reflects on the AMMQC experience as a case study in implementing career pathways approaches and extracts lessons that might inform practices in the field.



## CHAPTER 2: IMPLEMENTATION STUDY INTRODUCTION

The purpose of the implementation study for the AMMQC evaluation was to understand and document how the consortium colleges executed the various components of the initiative that they proposed for the TAACCCT grant and to assess how well the initiative realized the intended program model. These findings were then considered in the context of the broader U.S. training and education system and used to identify both promising practices that might be effectively applied elsewhere and aspects of grant implementation that were particularly challenging and may point to institutional barriers to promoting career pathways for adult learners. The implementation study findings were also used to interpret findings from the outcomes and impact studies of SPR's evaluation.

This chapter provides an overview of the findings of the implementation study and describes key features of the consortium-level implementation of AMMQC. The first section introduces how AMMQC was implemented overall and describes the service gaps that existed before AMMQC and the institutional context for implementation. The second section examines how MWCC, as the consortium lead, set up and executed the AMMQC initiative at the consortium level. These sections set the stage for the case studies of implementation at each college that follow in subsequent report chapters. The final section of the chapter provides an overview of the research questions and methods used to study implementation.

### Overview of Implementation

Overall, the consortium made progress on implementing all the major components of the AMMQC model proposed in the original grant application; however, some components were implemented more fully than others, for a variety of reasons. The key factors that shaped and constrained the implementation of the AMMQC initiative were the decentralized nature of the administration of the grant, variations in the regional economic contexts of the colleges (see Chapter 1), and various

#### Key Components of the AMMQC Initiative

- Intake and recruitment
- Student support during enrollment
- Curriculum development and enhancement
- Stacked and latticed credentials
- Articulation between the college and other educational institutions
- Online learning technologies
- Employer engagement
- Job search and job placement assistance

challenges posed by the institutional context of each college. The institutional factors affecting implementation included previous college experience administering federal training grants, separation between noncredit and for-credit programs, and slow-moving processes for hiring staff members and faculty.

The available evidence suggests that in implementing the initiative, the AMMQC colleges experienced many of the benefits that the USDOL intended for the TAACCCT program. The colleges used the TAACCCT

funding to boost their capacity to create and sustain career pathways that would benefit individual students, employers, and the regional economy.

“

*I think TAACCT had a lot to do with it because... all the equipment, all the training stuff.... We didn't have all that stuff three years ago, so I think that because we were able to go and buy the equipment, buy the trainers, buy the things to be able to educate the students and then we could up our game a little bit and start saying well we can now train people to a higher level and not just give you some entry level \$8.00 an hour temp worker you know kind of [position]. We can give you somebody who can program these machines, who can troubleshoot these machines, who can do maintenance.... A lot of the manufacturers have appreciated that...and they say this is what we've been looking for, this is what we've been trying to get.*

*- Regional Project Manager, Third Annual Site Visit*

”

In previous rounds of TAACCCT grants awarded to consortia, the lead college was the main grantee and the rest of the colleges were sub-grantees, which gave the lead college broad authority over spending. The Round 3 TAACCCT grants, in contrast, were set up so that all participating colleges received individual grants. Although lead colleges retained authority in overseeing the consortium's scope of work, implementation was decentralized in practice. For the AMMQC initiative, this led to specific strengths and weaknesses that will be analyzed in more depth in Chapter 9. The lead college, MWCC, often needed unanimous support from all the consortium colleges to move forward with consortium-wide activities, so in several cases efforts to develop centralized systems across the consortium ended up being implemented separately at each college. Partly because of fiscal decentralization, and partly because the consortium spanned several states with widely different local conditions, the consortium functioned in a decentralized fashion, with each college having substantial autonomy over how it implemented the grant components.

Under these circumstances, MWCC consortium leadership focused its efforts on cultivating consistent forums for cross-college communication, creating a supportive communication network among the participating colleges that would allow them to openly exchange information and share practices, and creating an organized framework to track progress on the multiple grant commitments. The consortium partners designed an innovative, consortium-wide project management structure based on communities of practice, or workgroups. The workgroups were designed to oversee various components of the grant, and each workgroup was charged with developing a work plan that identified goals and deliverables, action items, and persons or groups responsible for accomplishing each action item, along with a timeline for completion.

### *Gaps in Service Planning Before Implementation of the Initiative*

The AMMQC's initial TAACCCT grant proposal identified some specific service gaps in their collective advanced manufacturing career pathways and a need to expand the capacity of the colleges to retrain displaced workers (TAA-eligible workers, veterans, and other adult learners). The gaps that were identified included the following:



- a lack of industrial readiness programs that could help students make the transition from noncredit to for-credit training;
- no assessment of prospective students' manufacturing skills during the student recruitment and registration process;
- weak alignment of training program curricula with existing industry-recognized credentials in mechatronics and quality control; and
- an absence of flexible technologies for training delivery.

These gaps led the consortium to plan grant activities around the three strategies cited in Chapter 1: developing stacked and latticed credentials, enhancing online and technology-assisted instruction, and strengthening assessment and articulation (backwards, from the community college levels of study to the feeder programs at high schools and technical schools, and forwards from the community college programs to bachelors' degree programs at other higher educational institutions).

### *Effects of Institutional Context*

At each college, various factors related to the institution's structure, established procedures, capacity, and culture had a pronounced effect on the implementation of the initiative. Sometimes these factors facilitated implementation, in other cases they hindered it. For the purposes of this report, these factors, listed below, are collectively termed the *institutional context*.

**Degree of centralization in state administration of its community colleges.** Some states were more centralized than others in terms of their higher education policies, the level of coordination across community colleges, and oversight of college activities.

**Institutional divides between noncredit and for-credit activities.** Most community colleges did not administer courses that students take for credit through the same structures and departments through which they administer noncredit classes. Complex institutional politics can make it difficult to bridge the separation between these activities.

**Previous experiences with grant-funded projects and other concomitant initiatives.** AMMQC colleges with previous experience administering and implementing related grants (such as previous rounds of TAACCCT grants) were more likely to experience a smooth implementation process.

**Organizational position of AMMQC activities within the college structure.** At some colleges, grant staff members were positioned proximate to the college president's authority, while at other colleges grant staff members were more isolated from key channels of authority. This affected the staff's ability to implement some of the more institutionally complex aspects of the AMMQC initiative.

**Human resource challenges.** College processes for hiring and retaining staff members (human resources processes) varied in responsiveness and flexibility, and this had a significant influence on grant staffing and retention.

**Previous experience with tracking systems and performance management.** Some colleges did not have experience with performance-related measurement and tracking, and therefore lacked sufficient institutional capacity to effectively track participation, grant-related activity, and outcomes. These colleges also had difficulty obtaining data (such as wage records) from partner agencies.

**Limited resources for and experience with employer engagement.** Historically, community colleges in the U.S. have not focused many institutional resources on employer engagement and job placement. For some AMMQC colleges, starting to focus more on employer engagement involved a steep learning curve; those that had previously invested in employer relationships generally had an easier time enhancing those partnerships for the grant.

Considering that the consortium spanned four different states, each college faced a different constellation of institutional factors affecting its implementation of the initiative. The case studies of program implementation at each college, presented in Chapters 3–6, highlight the unique ways in which the institutional context mattered at each college.

Given the focus of TAACCCT grants on enhancing career pathway systems to better meet the needs of adult learners, some components of the initiative were focused on changing the institutional contexts of the colleges to render them more consistent with the goals of the initiative. The aspects of the AMMQC initiative that involved institutional-level changes included developing new credit-based curricula (which typically involved multiple levels of approval), creating new articulation agreements with other educational institutions, hiring and retaining staff and faculty members, changing the timing and pacing of coursework, and making permanent changes to assessment procedures, support services, tracking systems, and employer engagement practices.

## Consortium-level Implementation of the Initiative

### *Leadership and Management*

The consortium had two directors throughout the course of the grant period: one for the first year and one for the last three years. The first consortium director focused on startup activities like hiring staff members and orienting everyone to the initiative. The second consortium director, in partnership with an industry consultant, organized a list of tasks included in the grant proposal and then created working groups to implement different program components.

The consortium contracted with two external consultants to assist with consortium-wide implementation. The Manufacturing Institute, an affiliate of the National Association of Manufacturers (NAM), was hired to promote career pathways development by mapping AMMQC programs of study to the NAM-endorsed Skills Certifications system. The consultancy firm Thomas P. Miller and Associates was hired to review curriculum developed by AMMQC colleges.

The consortium was managed by a team of four individuals from MWCC:

- MWCC's vice president for lifelong learning and workforce development served as AMMQC's project director for more than half the grant period. In this capacity, she oversaw program development, consortium organization and communication, the development of consortium-level partnerships, compliance with grant objectives, and other key aspects of consortium operations.
- MWCC's dean of workforce development oversaw curriculum development across all consortium colleges.
- A data and compliance manager was responsible for collecting and reporting data as required by USDOL.
- A business executive with over 40 years of experience in the Boston area served as AMMQC's industry consultant. Using his private sector experience, he provided support for consortium-level planning and reporting processes.

Also responsible for consortium-wide management was the Project Management Council, which comprised the regional project managers from the participating colleges. This group implemented monitoring benchmarks, guided workgroups, informed internal executive teams, institutionalized activities to promote sustainability, and coordinated with external consortium-level partners (e.g., the Manufacturing Institute).

## Coordinating Consortium Activities

The master list of grant tasks produced by the second consortium director and the industry consultant functioned as a key device for coordinating the activities of the consortium members. These tasks, organized by the three main strategies of the initiative and derived from the original scope of work for the project, are presented in Exhibit 2-1. A checkmark in this chart indicates that the associated college committed to carrying out the task.

**Exhibit 2-1: Abbreviated List of AMMQC Tasks**

	MWCC	BPCC	NCSC	STCC
<b>Strategy 1: Develop and implement stacked and latticed credential and degree pathways</b>				
Enhance student assessments	✓	✓	✓	✓
Implement an entry-level job-readiness certificate	✓	✓	✓	✓
Develop and/or revise existing stacked-and-latticed credentials	✓	✓	✓	✓
Introduce/expand self-paced online academic remediation resources for students	✓	✓	✓	✓
Collaborate with the Manufacturing Institute (MI)	✓	✓	✓	✓
Share specialized expertise with other consortium members	Quality and Control	Process Control Mechatronics	Electrical Mechatronics	Industrial Mechatronics
Use a continuous process improvement model of data acquisition and interpretation	✓	✓	✓	✓
Engage employers and industry	✓	✓	✓	✓
Enhance partnership with the public workforce system	✓	✓	✓	✓
<b>Strategy 2: Use online tools and enhanced technology for instruction</b>				
Develop MOOCs		✓		
Develop online simulation scenario software		✓		
<b>Strategy 3: Link emerging competency-based pathways across states and colleges</b>				
Develop or improve common challenge exams	✓	✓	✓	✓

	MWCC	BPCC	NCSC	STCC
Implement enhanced prior learning assessments at intake	✓	✓	✓	✓
Negotiate or strengthen articulation and transfer agreements	✓	✓	✓	✓

### *Communication and the Tracking of Implementation Progress*

The consortium members checked in with each other regularly to track progress through the communication infrastructure established by the consortium director. All regional project managers and the consortium director engaged in biweekly conference calls and met face-to-face during quarterly consortium retreats. In the second year of the grant period, several workgroups comprising representatives from all colleges were created to address specific components of the consortium’s scope of work, and workgroup members had regular conference calls. In addition, members could reference material placed on a common website and network via the national advisory board. Each of these activities is described in more detail in the AMMQC Interim Evaluation Report.

In practice, the biweekly calls and consortium retreats were the most consistent communication channels for consortium-wide coordination, and these continued to take place consistently through the end of the grant period. Over time, they enabled the representatives from each college to develop strong relationships and to become a support network for each other. This support network appeared to be especially useful for new staff members or managers who took on an administrative role on the grant after someone else had departed, such as in the last year when the regional program manager for STCC retired and new staff members were onboarded.

Activity in the workgroups peaked in the middle of the grant, but then began to decrease as the groups achieved their goals; few workgroups were active in the last year of the grant. The common website continued to function past the start-up period, but it also was most heavily used in the second year and not used as frequently in the final grant year, aside from providing a repository for updates on performance reporting, curriculum enhancements, and other ongoing reporting needs. The national advisory board was utilized in the beginning and middle of the grant, but it was not engaged at the end of the grant period.

Establishing tracking systems was another key element of TAACCCT grant implementation, because producing performance measures to meet DOL requirements made it necessary to generate adequate participant-level data to share and analyze. As described in the AMMQC Interim Evaluation Report, the colleges initially planned to set up a centralized tracking system across colleges. However, because one college had reservations about using a centralized system, each college ultimately set up its own separate tracking system for the grant. However, for most of the AMMQC colleges—aside from MWCC, which had learned about tracking systems from a previous TAACCCT grant—setting up and using a student tracking system was a new experience. In the first two years, the college grant teams used Excel to track participant data, but ultimately several of them purchased a proprietary tracking system called G-STARS.<sup>15</sup>

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<sup>15</sup> Additional details about the colleges’ data collection and storage procedures are described in Chapters 7-8.

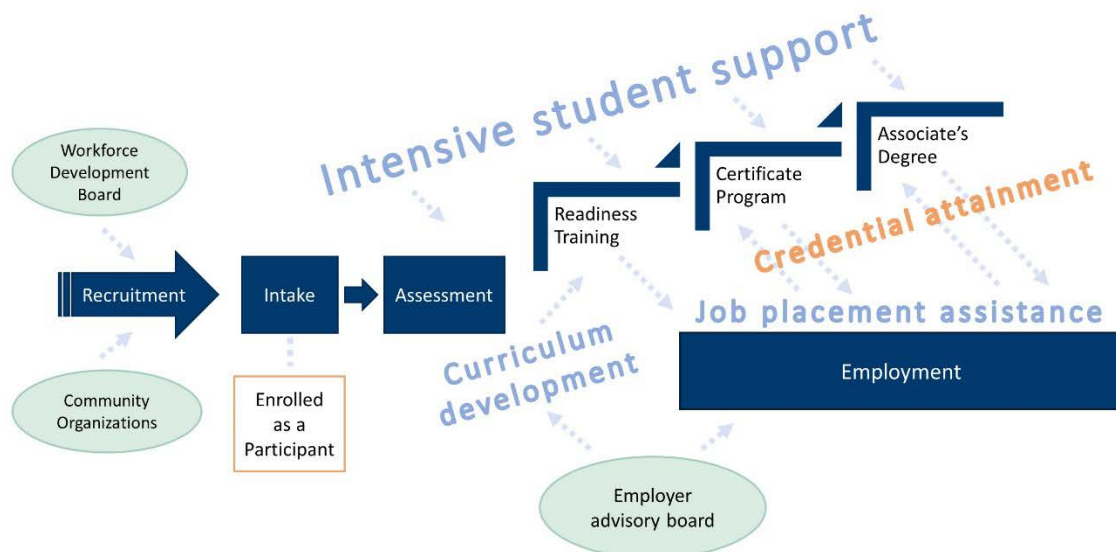
## Standardization of Implementation and Administration Across Colleges

As described in more detail in the AMMQC Interim Evaluation Report, the staffing structure for grant administration and implementation varied across the colleges, but the consortium maintained some standardization of the key roles of staff and faculty members. The staff roles for the AMMQC initiative were set up as follows:

- **Regional Project Manager:** oversaw all grant implementation and administration
- **Career Counselor:** worked with participants to provide student support services
- **Employment Specialist/Job Developer:** worked with participants to help them find jobs
- **Grant-funded Instructors:** taught courses in mechatronics and quality, developed new curricula, and integrated new equipment and credentials into courses
- **Accountants/Fiscal Specialists:** maintained financial records for the grant

Also standardized across colleges was the basic service model for the initiative. In line with the goals of TAACCCT grants, the AMMQC sought to invest holistically in career pathways for adult learners and overcome service gaps in terms of training in foundational job readiness skills (often referred to as “soft skills”). To accomplish this, it developed a service model for the initiative that involved providing intensive student support and job placement assistance, improving articulation within and between education institutions to make it easier for people to continue upgrading their skills, and increasing options for online learning to increase access and flexibility of training programs. Exhibit 2-2 below depicts the intended service model for the AMMQC initiative.

**Exhibit 2-2: The AMMQC Career Pathways Service Model**



Under this approach, students were to be recruited in partnership with community-based organizations and employers and then progress through an intake and assessment process before proceeding to training. The program was to target TAA-eligible workers, veterans, and other displaced workers and offer training in foundational job readiness skills as well as access to for-credit options if the individual completed the foundational readiness training. Individuals would complete one stage of training, then have the option of being placed in a job or transitioning to the next level of for-credit education—such as a one-year certificate program. Given the unique service needs of adult learners, providing this clear

linkage between noncredit and for-credit training would require extra supports for students, such as assistance with various barriers that could threaten their ability to complete their program (e.g., a lack of financial aid, childcare needs, transportation problems, mental health needs). Partnerships with employers would help ensure that the training curriculum met employers' needs and that employers could engage with the college for job referrals or hiring events. After students completed their training, they would receive industry-recognized credentials to document their new skill attainments and they would be provided job search and placement assistance to help them transition from training to work.

In practice, the colleges implemented the service model in varied ways; these variations are described and analyzed in the following case-study chapters. One of the main challenges experienced by the participating colleges in realizing the intended program model was having an adequate number of staff members.

## Implementation Study Design: Research Questions and Methods

The logic model presented in Chapter 1 informed SPR's development of the main research questions for the implementation study. As noted in Chapter 1, these questions were the following:

- How did contextual factors influence the initiative's unfolding?
- What partnerships were developed and how was the project managed?
- How was each of the AMMQC initiative's major components developed and launched?

The implementation study drew on multiple research methods, including document review, semi-structured interviews, participant observation, a survey of student completers, an employer survey, and focus groups with selected students and employers. The research for many of these methods was carried out during site visits to each college in the consortium. The site visits were conducted in three rounds, as follows:

- Round 1 visits: Fall 2014
- Round 2 visits: Fall 2015
- Round 3 visits: Fall 2016

Each site visit lasted approximately two days and included semi-structured interviews with key respondents that focused on the implementation topics articulated in the research questions. The SPR team members interviewed the regional program managers, deans from the academic divisions who administered the grant, student support and job placement counselors, faculty members, intake and data entry staff members, workforce development board directors, and career services staff members for the college. At MWCC, SPR team members also interviewed key consortium-level staff members, such as the consortium director, the data analyst, the assessment liaison, and the distance learning liaison. In addition to conducting one-on-one semi-structured interviews while on site, SPR team members also observed regional advisory board meetings (when feasible) and classroom instruction, and conducted focus groups with employers and students.

In addition to collecting data from the site visits, the SPR team also collected data from several other sources. For example, SPR team members participated in bimonthly project management conference calls for the AMMQC consortium and in quarterly consortium retreats to stay up-to-date on the progress of grant implementation. In addition, SPR conducted surveys of students and employers to explore the perceptions of these key groups and triangulated the findings from these larger survey samples with findings from more in-depth focus groups and interviews with smaller samples. The SPR team also reviewed relevant literature and grant-related documents—including reports that the Manufacturing Institute developed for the consortium on the IRT curriculum and Thomas P. Miller's assessment of



curriculum development—and included information from these data sources in the implementation analyses.

## **The Remainder of Part 1**

The remainder of Part 1 of the report presents case-study descriptions of the implementation processes at all four of the consortium colleges, starting with the lead college, MWCC. The implementation of the AMMQC initiative is analyzed within each college separately because of the vastly different regional and institutional contexts that shaped implementation, as described above. Each case study describes the regional economic context, the institutional context for the grant, the implementation of key program components, and progress toward sustainability. Each case study also includes a conclusion summarizing successes, challenges, and lessons learned. Chapter 9 examines results across colleges to identify common themes and key differences among the colleges. The goal of this synthesis chapter is to better understand the common factors that shaped success and those that reveal barriers to shifting to a career pathways approach in workforce training for advanced manufacturing.



## CHAPTER 3: MOUNT WACHUSETT COMMUNITY COLLEGE

Across four campuses in North Central Massachusetts, Mount Wachusett Community College (MWCC) has 287 faculty members, offers 75 degree and certificate programs, operates with a total budget of \$8.7 million, and serves more than 10,000 students. The college's Devens campus is about one hour west of Boston and less than half an hour from Worcester, within commuting distance of these and several other metropolitan centers. MWCC was the lead college for the AMMQC consortium, providing administrative oversight for the grant while also implementing its own grant-funded project at its Devens campus.

MWCC possessed several qualities that enabled it to provide strong leadership of AMMQC, including a stable administrative staff, a successful track record completing previous TAACCCT grants, and strong partnerships with local manufacturers. Over the grant period, the college was successful in achieving most grant objectives, and brought about several sustainable enhancements to the college's career pathways in mechatronics and quality control.

In this chapter, we begin by describing the economic context for AMMQC implementation in the North Central Massachusetts region and analyze how the institutional context shaped implementation at MWCC. Then we review how the college implemented the key components of the grant. The final section addresses sustainability and the college's overall achievements under the grant and describes the lessons learned from the college's participation in the AMMQC project.

### Economic Context

Over the past fifty years, the economy of North Central Massachusetts, once dependent on manufacturing, has experienced a dramatic and extended decline in the manufacturing sector. Between 2001 and 2012 alone, the region lost nearly a quarter of all manufacturing businesses and over one-third of its manufacturing jobs.<sup>16</sup> All subsectors declined over this period, with the most job losses in computers and electronics, fabricated metals, and chemicals and plastics. Economic losses associated with the Great Recession of 2007–2009 were particularly significant. During the AMMQC grant period, North Central Massachusetts' economy began to recover from the Great Recession. However, unemployment in the North Central region remained higher than the state average: in 2016, the local unemployment rate was between six and seven percent, nearly double the state rate of 3.6 percent.<sup>17</sup>

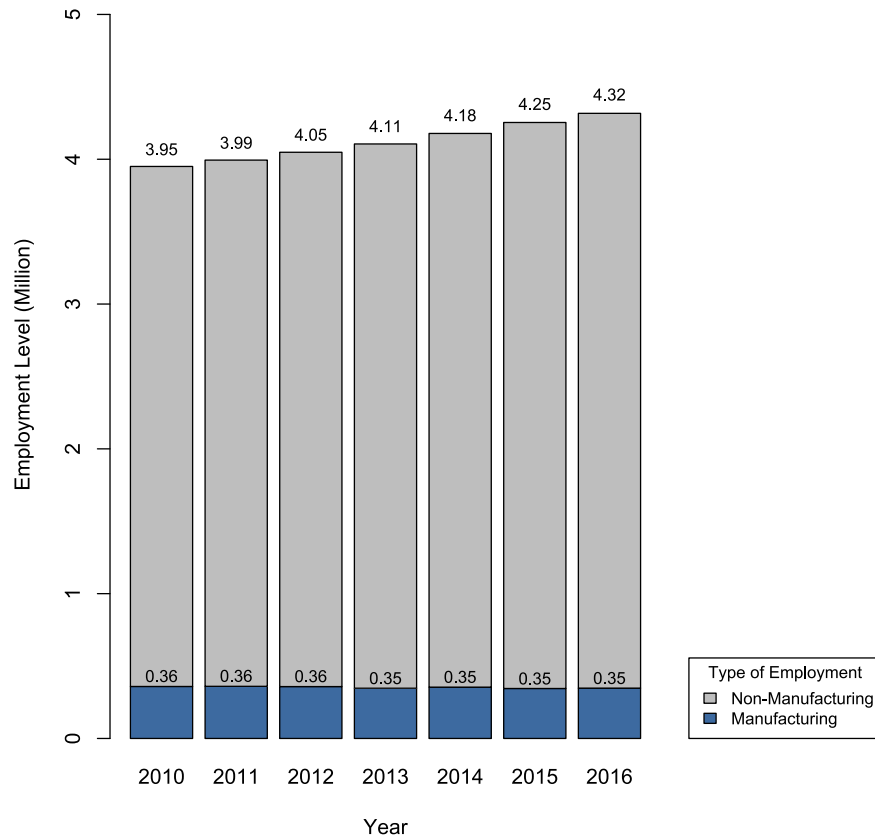
Despite the historic decline in manufacturing (which mirrored trends at the national level, as discussed in Chapter 1), the North Central region has retained a strong manufacturing base, and is a fertile ground for manufacturing-oriented initiatives such as AMMQC. The overall number of manufacturing jobs in the college's economic region exceeds the number in the regions of the other consortium colleges. As shown in Exhibit 3-1, regional employment has been growing consistently in recent years, while the number of manufacturing jobs in the region has remained stable, leading to a very slight decline in the proportion of manufacturing jobs.

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<sup>16</sup> Renski & Wallace (2014).

<sup>17</sup> Bureau of Labor Statistics, Local Area Unemployment Statistics.

**Exhibit 3-1: Annual Averages of Monthly Employment Levels in the MWCC Economic Region, 2010–2016**



Source: Bureau of Labor Statistics, Quarterly Census of Employment and Wages

### *Advanced Manufacturing*

North Central Massachusetts comprises 32 communities with a strong manufacturing base. Manufacturing is particularly important in the region as a source of private sector employment. One of every four private jobs in this region is in manufacturing, and one of every three dollars in private payroll is earned in manufacturing. With over 450 manufacturing companies representing 17 industry subsectors, the region has the highest percentage of the private labor force employed in manufacturing in the state.<sup>18</sup>

The manufacturing base in the regional economy provides a dynamic and shifting backdrop to the AMMQC project, with both contractions—such as occurred when an injection plastic biomedical manufacturer company downsized—and growth—as when Bristol-Myers Squibb doubled its footprint in Devens. Another recent example of the expansion of production in the region occurred when Bio-Techne purchased a building adjacent to MWCC and moved its quality lab there in 2016.

<sup>18</sup> North Central Massachusetts Workforce Investment Board Strategic Plan 2016 - 2019  
<http://www.mass.gov/massworkforce/docs/resources/wib-certifications/north-central-strategic-plan.pdf>

Advanced manufacturing is a “particularly vital component of the North Central region’s economy,”<sup>19</sup> accounting for approximately nine percent of the total jobs in the North Central region – the highest share of any region in the state. Advanced manufacturing also pays more, on average, than any other major industry sector in the region. The North Central Massachusetts Economic Development Council noted that workers in North Central Massachusetts earn an average annual salary of \$58,000, which is approximately \$15,600 more than the annual salary of the average non-manufacturing job. Unlike other regions in the state, the North Central region is not dominated by any single manufacturing subsector. Instead, it has significant industrial specialization in every advanced manufacturing subsector, except food processing and production.<sup>20</sup>

Manufacturing subsectors that began to show signs of recovery from the Great Recession by 2014 included metal fabrication, production of medical equipment, and food processing; all have added net jobs since the Recession. In contrast, employment rolls in the chemicals and plastics, computers and electronics, and paper and printing subsectors continued to decline. Each week, the North Central Massachusetts Career Center lists the top “hot jobs” provided by employers; as of May 2017, roughly half of the companies listing positions were in manufacturing. Computer-Controlled Machine Tool Operator and Electrical Engineering Technologist are two occupations in particularly high demand, with expected growth in employment in the Commonwealth of Massachusetts over the next seven years [O\*NET OnLine].

Given the improving economy during the grant period, MWCC students were attracted to training programs that would enable them to obtain the higher-paying jobs that required specific manufacturing skills. The workforce development board director stated:

*In times like these, workforce intermediaries tend to work with businesses rather than individual job seekers (as they would if the economy is in a downturn). This puts pressure on the workforce development systems to identify the labor force needed to fill the vacancies.*

### **Manufacturing Labor Market**

MWCC is situated in the greater Worcester economic region, which includes the city of Boston. MWCC’s region includes twenty-one counties in the states of Massachusetts, Connecticut, New Hampshire, Rhode Island, and Vermont. In recent years, this region has had an unemployment rate below the national average; this rate has also been lower than those of the other regions in the AMMQC consortium.

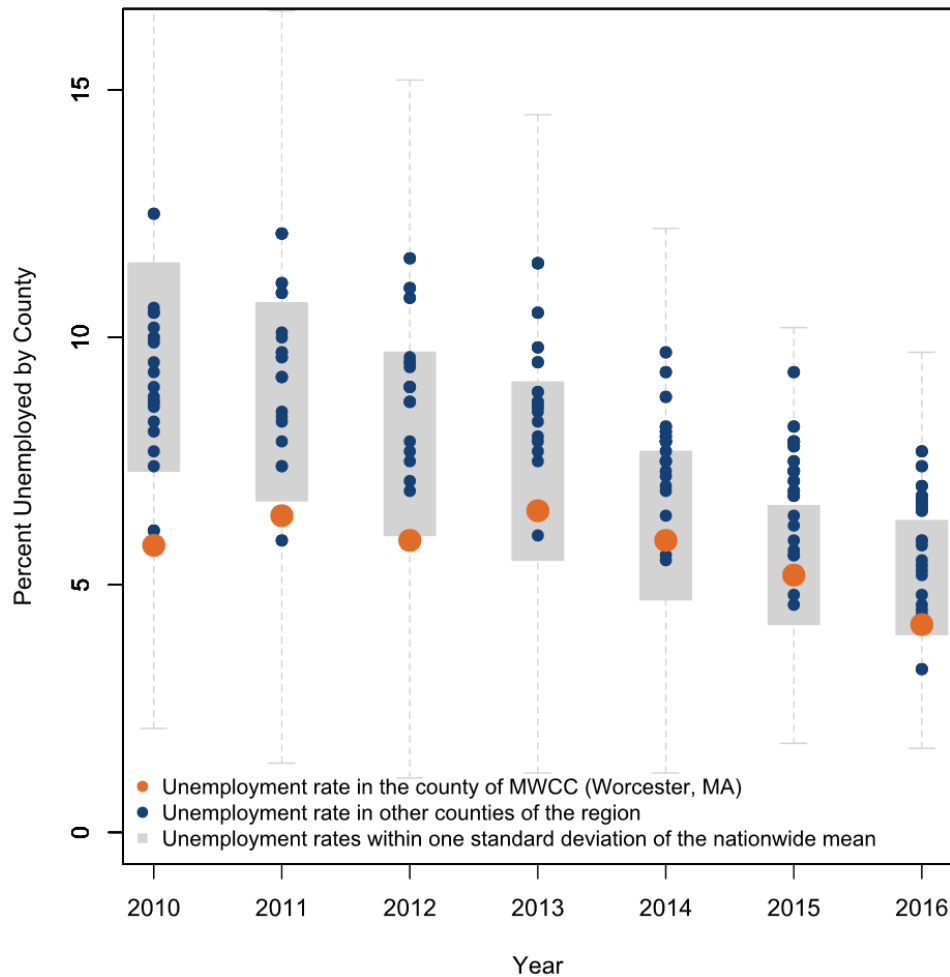
Exhibit 3-2 below shows unemployment rates in all counties of MWCC’s economic region, compared to the unemployment rates of counties in the nation that placed within one standard deviation of the mean unemployment rate nationwide. The average unemployment rate in this region has declined recently; however, not all counties in the region experienced this decline and not all counties kept pace with the improving economic condition in the nation as a whole. Whereas in 2010 all but one county fell within or below one standard deviation of the unemployment rate nationwide, in 2016 roughly half of those counties experienced rates that were higher than this range.

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<sup>19</sup> Renski & Wallace (2014).

<sup>20</sup> Renski & Wallace (2014).

**Exhibit 3-2: Unemployment Rates in Counties of the Mount Wachusett Community College Economic Region, 2010 – 2016**



## Institutional Context

MWCC is administered by a president and six vice presidents who report to the president. MWCC's vice president for lifelong learning and workforce development served as AMMQC's national consortium director. In this capacity, she oversaw project management in all its aspects, including program development, consortium organization and communication, consortium-level partnerships, and compliance with grant objectives. The MWCC regional project manager, who oversaw grant activities within MWCC, had previously held various positions at MWCC, including that of campus director.

Both the national consortium director and the regional project manager had been with the college for many years when the project began, which facilitated a smooth implementation of grant programs. In addition, the relatively high organizational stature of the consortium director—she had worked for 15 years with the MWCC president—allowed her to easily seek and obtain support from the college president and other key administration personnel for grant implementation activities. The importance placed on workforce training and noncredit curricula at MWCC is reflected by the fact that the vice president for lifelong learning and workforce development reports directly to the MWCC president. As

the AMMQC director stated, “I think that the direct line of communication is absolutely necessary for us to flourish, and ... I think it’s very helpful that I have the title of vice president, as opposed to something like a director.”

MWCC was well prepared to both lead the consortium and carry out its grant objectives internally. The college leveraged expertise from its previous TAACCCT 1 grant, which created a strong foundation to build upon for the AMMQC TAACCCT 3 grant. As a TAACCCT 1 grant recipient, MWCC had already created the Industrial Readiness Training (IRT) program. Also, both the national consortium director and the regional project manager had been heavily involved in the TAACCCT 1 grant, so they were both familiar with what is required to effectively lead and implement a TAACCCT grant. In addition, MWCC leveraged expertise and resources from a recent National Science Foundation grant to develop curricula for the new AMMQC courses.

## Grant Implementation

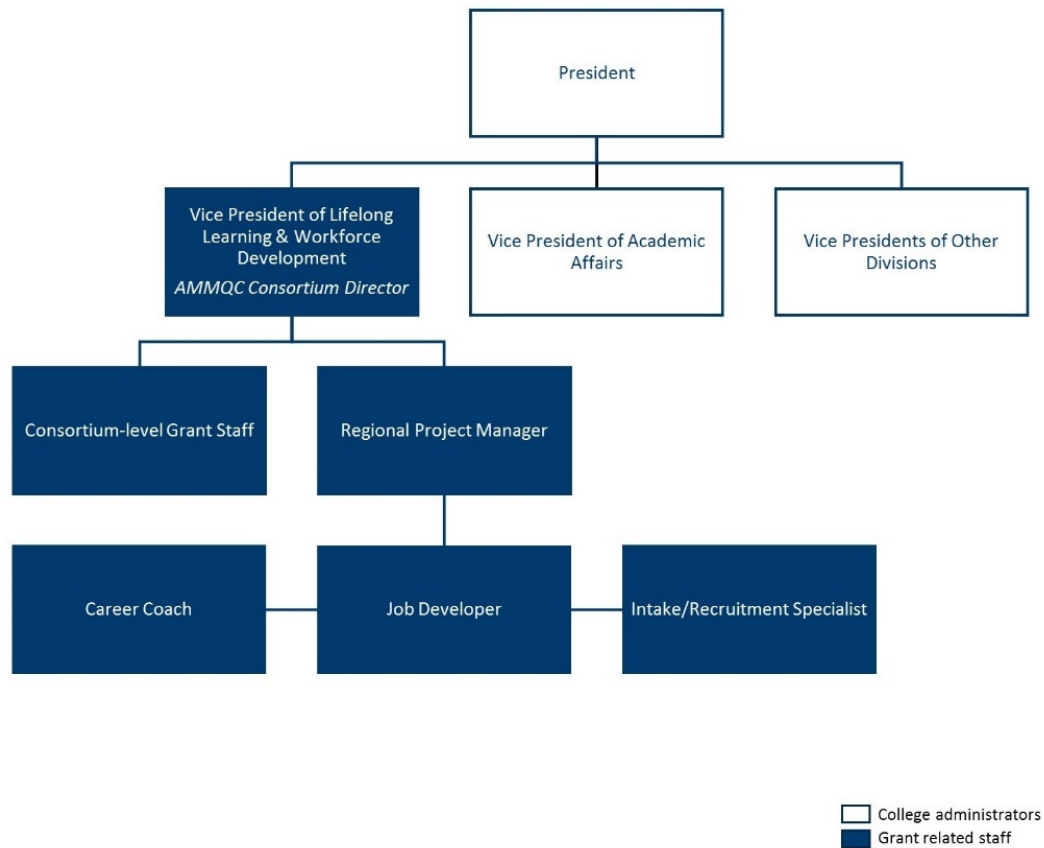
MWCC began implementing AMMQC by enhancing the IRT program, which consisted of purchasing equipment for instruction and expanding curricula. Once this was accomplished, the grant team began building new noncredit programs focused on quality control and career pathways linkages to credit programs (mostly focused on quality control).

### *Grant Staffing*

MWCC-level implementation was overseen by the regional project manager, who supervised recruitment and intake specialists, career coaches, and job developers. Staff turnover was noticeably lower compared to that at other AMMQC colleges, with many staff members holding their positions throughout most of the grant period. In addition, when staff transitions did take place, the grant team did not experience adverse effects on grant activities because it was able to recruit new staff members relatively quickly (mostly on a temporary and part-time basis).

Exhibit 3-3 shows the overall organizational chart for the administration of the initiative at MWCC, at both the consortium level and the college level.

**Exhibit 3-3: MWCC Grant Organization Chart**



### *Recruitment and Intake*

While MWCC faced some challenges in meeting enrollment goals early on, by the end of the grant it had exceeded its recruitment goals. The grant team used different methods to recruit students into for-credit and noncredit programs. For noncredit program recruitment, the grant team built strong relationships with local high schools and career centers. Two staff members were primarily responsible for outreach and recruitment. They employed multiple strategies, often in combination, to recruit students, including holding information sessions, posting flyers in public buildings, making community presentations, and organizing job fairs. MWCC staff members also worked with an American Job Center, veterans' organizations, and local school systems to recruit students and target TAA-eligible individuals and veterans. The staff members interviewed by SPR indicated that all the recruitment methods met with equal success.

The recruitment of students into credit programs primarily relied on existing college channels for student recruitment; for a brief period, however, a grant-funded staff member was placed within the college's advising office and actively recruited students for AMMQC-funded credit programs.

Students interested in enrolling in noncredit programs typically attended an informational session at MWCC's Devens campus. During the information session, the prospective students learned about the program's eligibility and time commitment requirements. Prospective students were required to obtain



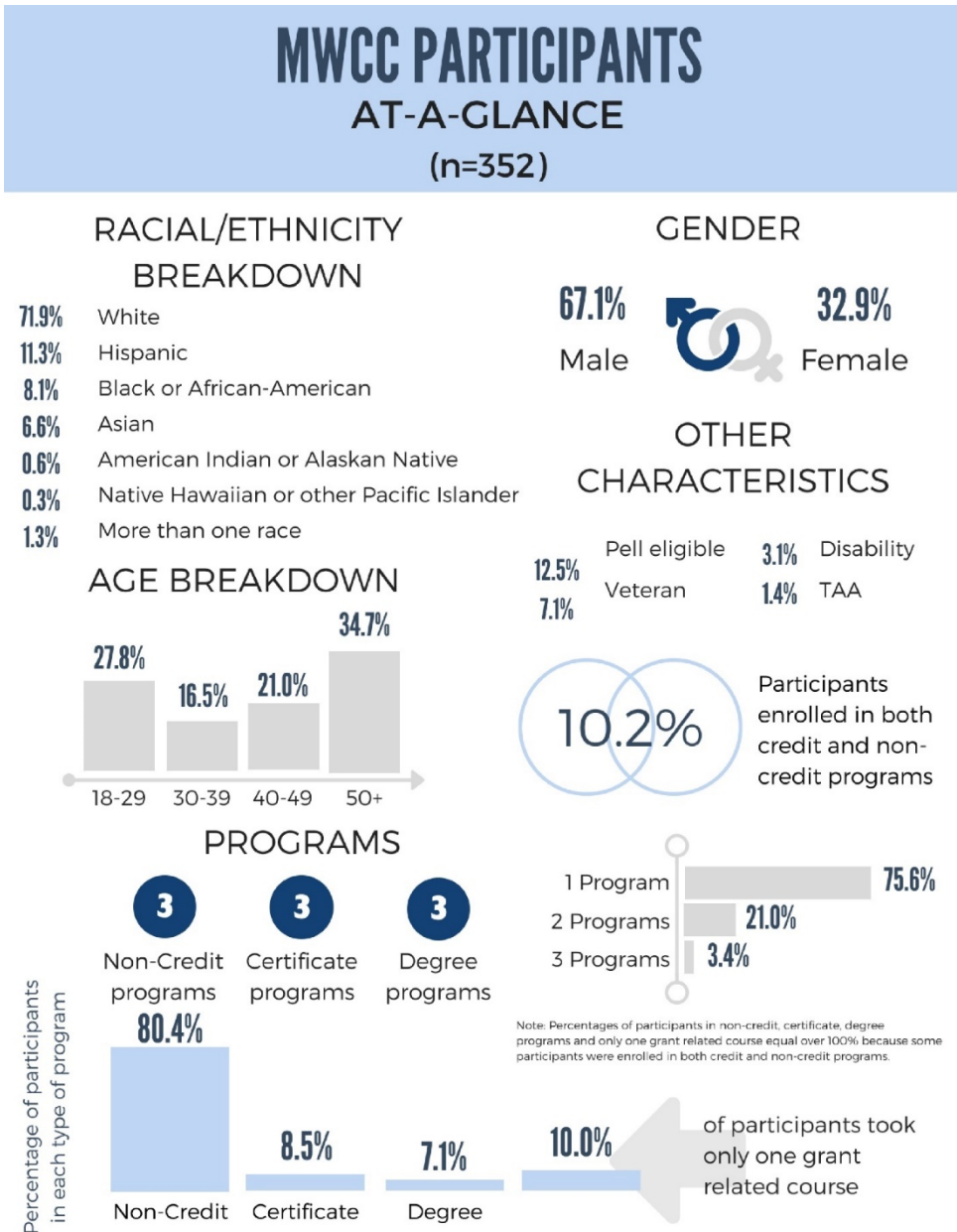
a minimum score of three in the reading and math sections of WorkKeys, indicating that they were at an appropriate level for successfully completing the program. Then, students completed a program questionnaire about their career goals and past work experience. The questionnaire also asked about any potential barriers to completing the program, such as lacking reliable transportation or childcare arrangements.

The final step in the intake process was an interview with a job coach. Prospective students were asked to bring their resumes and completed questionnaires to the interview. The purpose of this informal interview was to determine whether the program was an appropriate fit for them and was aligned with their career goals.

Credit students enrolling in AMMQC programs followed the regular intake process for all MWCC students.

As a result of the recruitment efforts, 352 unique AMMQC participants enrolled in TAACCCT-funded programs at MWCC. These students were predominantly white, male, and over 40 years of age. A third of AMMQC students at MWCC were 50 years or older—none of the other AMMQC consortium colleges came close to having such a high proportion of older students. Three quarters of the students were enrolled in just one program, with 80 percent enrolled in noncredit programs. Students in noncredit programs were somewhat more likely to be 50 years or older and somewhat more likely to be female compared to credit students.

Exhibit 3-4: Characteristics of Grant Participants in AMMQC



**10.0%**

of participants took only one grant related course

### Student Support and Job Placement

Student support services varied considerably between noncredit and for-credit participants. AMMQC grant staff members focused predominantly on noncredit students, while credit students accessed academic counseling and support services through their degree programs. The grant team believed that noncredit students needed more support to successfully complete certificate courses and find employment. One job coach stated:

*While I don't want to make a huge distinction between the credit and the noncredit classes, because we want the credit students to obtain employment too, they are, in a*

sense, on different tracks. The credit students aren't necessarily looking for those types of jobs right now — they want to finish their program first.

### STUDENT HIGHLIGHT

#### *Pursuing: Professional Certifications*

Stephen is a married man who works full-time and has a child with autism. He loves working with machines, and while he has a full-time job, he is hoping to find a new job that pays more. He recently became a Certified Administrative Assistant (CAA) for bookkeeping/accounting, before learning about the certificates he could earn in the manufacturing program. He hopes that the program will enable him transfer into a better job; however, he will be unable to do any of the internships available through the program.

*"I have to leave my job if I go to that internship. I don't know if they're going to take me [after I complete] the internship. How do I know if I'm going to be all right? With a family, I can't gamble."*

The job coach contacted program completers by phone or e-mail on a weekly basis, forwarding relevant job postings and providing job search support. Students appeared to place a high value on the quality of support available from the grant team. According to one MWCC student, "the people they have here are really good; if you have any kind of question, they will make time for you."

The job coach identified transportation, childcare, and self-confidence as some of the most common challenges that participants (both credit and noncredit) faced in successfully completing AMMQC programs (see student highlight, above). Students in the focus groups also identified funding as a major barrier, as well as difficulty managing work, training, and personal responsibilities at the same time. Students also explained that, while they found the quality of the training excellent, it was very challenging to find employers who understood its value:

*Something's got to get done to [tell the employer that the student] from this school and program is better than your entry level... The school has been a little bit helpful, but not very helpful on that. Education-wise, top notch, but once [we're] out there, it's like nobody wants [us... employers] don't know the certifications we're getting and what it means and the work involved to get it.*

MWCC replicated a promising practice from BPCC in the final year of the grant called the "resume café" (see Chapter 4). This was essentially a "speed dating" approach to introducing employers and students to each other. MWCC staff members prepared the students with mock interviews and other forms of job search assistance, and they encouraged students and employers to exchange contact information, resumes, and business cards. MWCC staff members reported that several students had secured interviews and jobs from this event.

Both students and employers had positive feedback regarding the resume café, with one local employer stating, "I love the resume cafes." According to a MWCC student who participated in a focus group, "Those are so neat. You can get hired right there on the spot."

Despite the positive feedback, some students in the focus groups expressed a need for giving more attention to employer engagement in general so that employers would not treat them the same as anyone off the street. Several students also mentioned that it was difficult to "take a chance" on a temporary position or internship with an employer in manufacturing if they already had a stable job in

another field and depended on the regular paycheck (see the student highlight). Students also expressed frustration with employers' use of temp agencies and their lack of awareness of certificates earned through AMMQC programs. An MWCC student stated:

*When you go out into the field, half of the credentials we were getting, the [National Career Readiness Certificate], for the gold, silver, platinum evaluation – nobody knows it here. You know, you tell them I personally got gold, you tell them that and they go, 'well, what's that?'*

## Training Programs and Curricula

MWCC developed both credit and noncredit programs as part of its grant activities, involving faculty and staff members from both the workforce development and for-credit divisions. Although these divisions had collaborated before, transition from noncredit to credit programs had not been a major focus at the college. Because of the substantial demand among employers for workers with skills in mechatronics and quality control, curriculum development at MWCC mainly focused on these areas. As described below, on the noncredit side, two new programs were created and one was enhanced. In addition, the project team created two new credit programs and enhanced two additional credit programs.

## Noncredit Programs

Prior to the AMMQC grant, MWCC offered certificate programs in Advanced Manufacturing IRT and Medical Device Manufacturing. As shown in Exhibit 3-5, under the AMMQC grant, two new noncredit certificate programs were developed and the Advanced Manufacturing IRT certificate program was enhanced.

**Exhibit 3-5: MWCC Noncredit Curriculum Programs Developed for the AMMQC Grant**

Program Name	Type of Credential	New or Enhanced
<b>Automation Technician Training</b>	Certificate of completion	New
<b>Industrial Readiness Training (IRT)</b>	Certificate of completion	Enhanced
<b>Quality Systems Training (QST)</b>	Certificate of completion	New

The three noncredit programs are described below.

- Automation Technician Training:** Piloted in October 2015, this course was developed in consultation with a local employer, NyPro Medical. Project staff members reported that this certificate program was created as a direct response to the growth in the injection molding plastics industry in the area; however, the skills taught in this certificate program were also transferable to other manufacturing subsectors. The program was designed to align with the mechatronics certification (see below under Credit Programs). This six-week course provided 24 hours of training. It was designed as an introduction to automation, with hands-on activities and demonstrations using mechatronics equipment and robots. It was advertised as an entry point to mid-career individuals who are looking for re-training to enter the field of advanced manufacturing.

- **Industrial Readiness Training (IRT):** The enhanced IRT program was developed from existing curriculum developed under a TAACCCT 1 grant (and thus no new curricula were created for this program). MWCC's dean of workforce development oversaw the enhancement of the existing curricula for the IRT program, a process that involved soliciting input from local employers via the advisory board. In addition, an adjunct instructor was hired to enhance the existing curricula by adding more visuals and hands-on lessons using equipment. The IRT was offered every 8 weeks on a repeating cycle. IRT was also seen as a feeder program for the Mechatronics certificate, and in fact the college's Mechatronics web page recommends students to "investigate the noncredit Industrial Readiness Training program as an introduction to this field."
- **Quality Systems Training:** Also known as the "quality boot camp," the Quality Systems Training Program was a short-term intensive noncredit training course designed to prepare students for jobs in quality assurance and quality control. The training typically ran for two weeks, four days a week, 5.5 hours each day (for a total of 29 hours). The curriculum included nine modules (Concepts in Quality; Quality Systems Auditing, Measurements, Inspection and Sampling; Print Reading and Analysis; Teamwork; Conflict Resolution and Communication; Root Cause Investigation; CAPA Systems; Validation; and Lean Six Sigma).

Students who took the IRT program generally found it highly valuable. They expressed a desire to learn more, as well as a sense of pride in what they had already learned. For example, one student said:

*It made me feel like I'm a professional, like I'm smarter, like I know what I'm doing. I'm just opening something like that machine and like, you know, sometimes it's like the first time I just opened it, I'm scared, like I better not touch anything or I'll like break it, and now I know like you open it and like I know where it is, I know that's the pilot, that's this stuff, that's the burner, that's a thermal, that's a drain pipe, that's the inlet, that's the outlet, that's all the stuff.*

MWCC faculty and staff members took advantage of the new equipment purchased through the grant to improve the IRT program by adding hands-on training taught by instructors with real-world manufacturing experience. Enhancing noncredit programs in this way was a standout feature of MWCC's AMMQC initiative, and constitutes a promising practice insofar as it enables noncredit students to experience technology first-hand, which may motivate them to continue their education along advanced manufacturing career pathways.

## Credit Programs

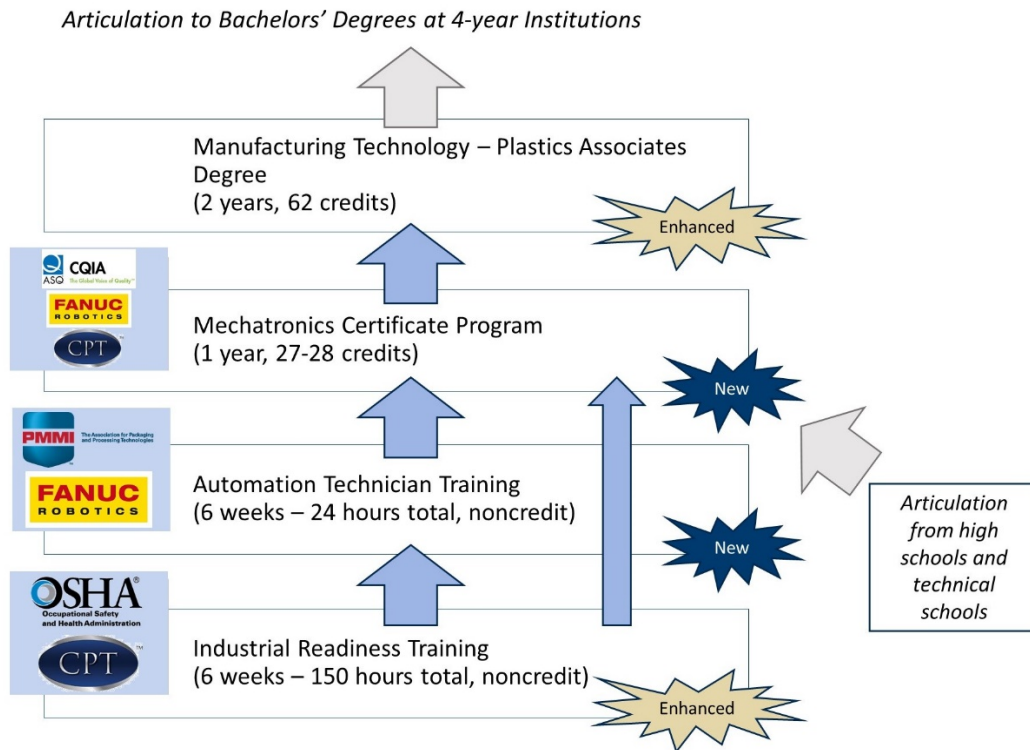
At the heart of the credit programs were two well-designed career pathways with stackable credentials, focused on quality assurance and mechatronics, respectively. The quality systems (ALQS) one-year certificate leads to the quality-enhanced biotechnology associate degree; the one-year mechatronics certificate leads to an advanced manufacturing plastics two-year degree. Both associate degrees have articulation agreements with four-year institutions. The programs that were developed are listed in Exhibit 3-6 below.

**Exhibit 3-6: MWCC Credit Programs Developed for the AMMQC Grant**

Program Name	Type of Credential	New or Enhanced	No. of Credits
<b>Analytical Lab Quality Systems (ALQS) Certificate</b>	1-year certificate	New	28–29
<b>Mechatronics Certificate</b>	1-year certificate	New	27–28
<b>Biotechnology - Analytical Lab Quality Systems Degree (BTDQ)</b>	Associates degree	Enhanced	65–67
<b>Manufacturing Technology – Mechatronics (Degree)</b>	Associates degree	Enhanced	62

In combination, the noncredit and credit program offerings developed at MWCC constituted two major career pathways, one in advanced manufacturing and the other in quality systems. The advanced manufacturing pathway can start with either of two noncredit programs (IRT or ATT), or both, and can continue with the mechatronics certificate, followed by the manufacturing degree, as shown in Exhibit 3-7.

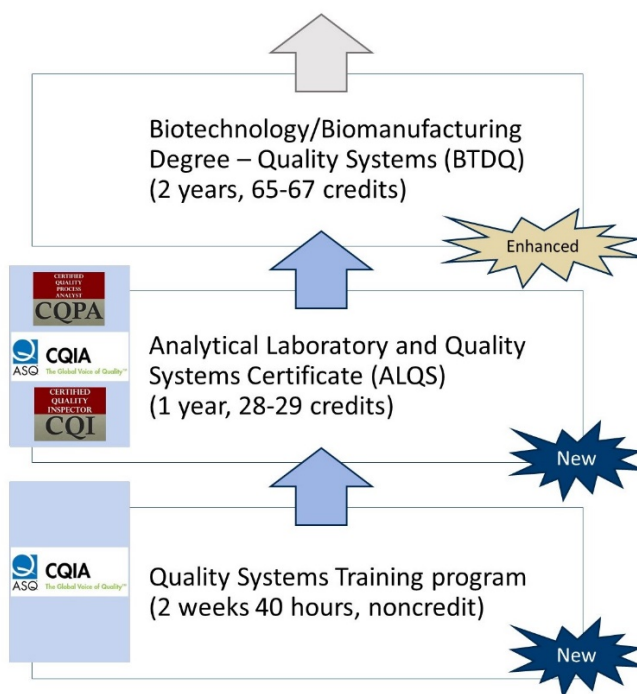
### Exhibit 3-7: Advanced Manufacturing Career Pathway



The quality-focused pathway starts with QST (noncredit) and continues with the ALQS certificate and the quality-enhanced biotech degree (see Exhibit 3-8).

### Exhibit 3-8: Quality Systems Career Pathway

#### Articulation to Bachelors' Degrees at 4-year Institutions



#### Articulation and Career Pathways

The two career pathways described in the previous section were not simply theoretical. As shown in Exhibit 3-4, one quarter of AMMQC participants enrolled in more than one grant-funded program and 10 percent enrolled in both noncredit and credit courses, both of which indicate advancement along the pathways. Although the college did not institute special articulation agreements between grant-funded programs, the grant team was instrumental in convincing many grant participants to enroll in additional grant-funded training, and to see the value of gaining additional credentials.

Despite this success, respondents reported that the program found it challenging to reconcile program completers' need to secure jobs with their own desire to encourage participants to continue in additional skills training. MWCC's regional project manager felt that it was not always realistic for nontraditional students to continue their studies by enrolling in credit programs because getting a job quickly was an important consideration:

*The advantage [of offering both credit and noncredit options] is [that] the college meets the needs of the whole community, which is the purpose of a community college. The disadvantages sometimes can be that academics are thinking in terms of ... degree attainment and sometimes lose sight of a student who isn't a traditional student.*

#### Online and Technology-Enabled Learning

MWCC did not develop online courses, but did make progress on moving more course materials into an online format. By the final year of the grant, the college had made progress offering curriculum online and using more online tools in its courses. One of the students in the IRT program really appreciated the interactive online component of the course:



*I like in the IRT program, the six-week program, the KeyTrain interactive thing they had online for us to revisit our skills and see where we can improve ourselves. That was helpful for them to have that set up for individuals to come in, do it on their own time and guess where they're at, get an idea of what they need to improve in order to be more successful ongoing. So, the Key Train thing was really, really good.*

MWCC made significant upgrades to the equipment used for training in credit courses. Most of the equipment was purchased during the second year of the grant period and was in use by the third year. Almost all the new equipment was acquired for use in the mechatronics programs; this equipment included a 3-D printer, process control systems, FANUC robots, and assembly line trainers, which mimic production lines and allow students to get hands-on experience. The equipment purchased for the quality control programs included an optical comparator, an oscilloscope, a universal tester, and an environmental chamber. This equipment facilitated additional hands-on learning, which received positive reviews from students. One student called the hands-on learning experience “a very, very good visual.” The student further explained, “That’s what helps me to see what’s really happening.”



## *Partnerships*

MWCC recruited local employers to serve on its regional advisory board for advanced manufacturing, and worked with many local employers, to varying degrees, to place students in employment. For the most part, the employers serving on the advisory board contributed to the AMMQC grant by offering feedback on the curriculum, outreach and marketing, and student recruitment. One employer stated:

*I initially contacted the program because I needed a list of graduates for a hiring need. I hired a couple of people and they are great; I only have great things to say about the program in that regard...*

AMMQC's industry consultant helped assemble the advisory board based on his knowledge of the business sector. Grant staff members and the industry consultant tried to have representation from both large and small employers, as well as a variety of industries including plastics, pharmaceuticals, steel construction, and equipment manufacture. MWCC leveraged the industry consultant's previous participation in the 15-year-old North Central Massachusetts Manufacturing Roundtable. Regional advisory board members met quarterly. Some of the most engaged employers were Rocheleau Tool and Die, Georgia Pacific Dixie, and Bio-Techne.

Although establishing a relationship with the college was often difficult and time-intensive, most employers viewed the working relationship as necessary and beneficial. One employer was particularly encouraging: *"keep doing this employer engagement because it's something that's definitely needed."* Another employer stated:

*"I advise bringing in a state-oriented business economic advisory board and engaging with them through events or associated events. This would be beneficial to the employers in helping find out about events, programs, legislation, and to help continue developing relationships."*

A local Workforce Development Board (WDB) played a central role at MWCC, in part facilitated by the role of the WDB director as a member of MWCC's regional advisory board. The North Central Massachusetts WDB serves twenty-three cities and towns, primarily in Northern Worcester County, designated by the governor as the North Central Workforce Development region. The WDB Director reported a close working relationship between the local career center and MWCC. For example, MWCC job coaches referred individuals to the local career center if they were Workforce Innovation and Opportunity Act (WIOA)-eligible. Similarly, the career center referred individuals to MWCC who seemed to be a good fit for the AMMQC grant-funded programs.

## Sustainability

With the continuing strength of manufacturing in the region, the college planned to continue instilling a pathways-focused model into its advanced manufacturing programs. The college was determined to continue both the noncredit and credit-based programs created or enhanced under the grant, in part through contract trainings funded by employers and in part through additional grants that the college had been awarded. The regional project manager affirmed the value of the training offerings developed under the grant, given the continuing demand for workers with the appropriate skills:

*The resurgence of manufacturing in the region really lit the fire under us, but what it will do for the college is create a whole menu of modules of noncredit courses that can be used for workforce grants with industry. It can be pulled out to train folks for the industry.*

Grant staff members also viewed the recent establishment of a manufacturing task force within the regional Business Roundtable, which includes policy makers, business leaders, and educators, as a key vehicle for continuing advanced manufacturing workforce development activities in the region.

MWCC will be building on its work from the AMMQC grant through a new TechHIRE grant awarded to a regional consortium within Massachusetts. The new TechHIRE grant will focus on the college's quality control curricula, which will be expanded and enhanced. In addition, the TechHIRE grant will allow the college to offer the noncredit IRT certificate as a foundational program for its new Computer Numeric Control (CNC) training program.

The grant staff and faculty members were excited about the opportunity to use the TechHIRE grant to continue the work that they started with AMMQC. According to the consortium director, TechHIRE “will continue to partially fund the dean of Workforce Development position, and it will expand our reach because we will be getting a machining curriculum that the other colleges have developed which we don't have right now.”

One of the faculty members, who will be funded through the TechHIRE grant, said that she was excited because TechHIRE will allow the college to share its curricula regionally:

*We are going to share with [the region] our quality technician training, which is taking our QST and our quality curriculum and expanding it to a 100-hour program, and now they can teach that at their school, so now we're kind of having a broader impact.*

The receipt of follow-on funding will open many possibilities for building on and regionalizing what the college achieved through AMMQC. It will also allow the college to retain valued instructors who were instrumental in building the new curriculum. Unfortunately, the TechHIRE grant will not cover any student support, so those staff members providing student support services will not be retained after AMMQC.

## Conclusion

MWCC successfully implemented the AMMQC grant, meeting or exceeding its goals and most performance targets. Its success was facilitated by a resurgent manufacturing economy in the region, strong and stable leadership, support from community college leaders, and positive engagement with the business community and employers.

## Key Accomplishments

MWCC accomplished a great deal under the AMMQC grant:

- **The creation of noncredit and for-credit programs connected along clear career pathways.** Noncredit and for-credit programs were created and enhanced along two pathways: Quality Control and Advanced Manufacturing/Mechatronics.
- **The leveraging of expertise from other grants and funding streams.** As a TAACCCT 1 grant recipient, MWCC came into AMMQC having already laid the groundwork for the advanced manufacturing IRT course and the program enhancements that it wished to make under the TAACCCT 3 grant.
- **Enhancement of programs through consortium knowledge exchange.** MWCC enhanced its institutional capacity through the exchange of information and strategies with other consortium colleges. For example, MWCC adapted BPCC's innovative job placement support strategy, the “resume café,” resulting in increased placements for noncredit program completers.
- **Increased employer engagement and relationships.** The college's connection to the manufacturing business community and its level of awareness of their manufacturing programs improved throughout the course of AMMQC.
- **Positive feedback from students about the quality of the training programs.** Students in the focus groups generally agreed that their training programs not only taught them new technical skills, but also boosted their self-confidence and connected them with peers who could provide support and advice.

- **Use of equipment for noncredit instruction.** MWCC utilized instructional equipment purchased through the grant for both noncredit and credit instruction. This represents a promising practice because it allows noncredit students a higher level of training but also because it familiarizes trainees with advanced technologies, making it more likely that they will continue their training along career pathways.

## *Challenges and Lessons Learned*

Despite the college's overall success in implementing the AMMQC program, it experienced several challenges, some of which may provoke the use of different strategies going forward or in the implementation of future initiatives.

- **The college had difficulty placing some program completers in advanced manufacturing jobs.** Because many local firms relied on temporary agencies and did not fully appreciate the value of industry-recognized certifications, the college did not place as many program completers in advanced manufacturing employment as it would have wished. One lesson learned from this experience is that together with engaging with employers through participation in regional advisory board meetings and the organizing of job-related events, a "thicker" type of engagement is also necessary and consists of being involved in companies' staffing decisions and in shaping regional development policies. In addition, in the future colleges could exploit their connection with employers to communicate to employers that using staffing agencies might be more expensive in the long run because of additional time spent teaching job-specific skills to new employees.
- **Employers and others in the community were not fully aware of the quality of the college's new and enhanced advanced manufacturing pathways.** Students in the focus groups reported that employers and those in the community at large were mostly unaware of the caliber of skills that completers possessed. This suggests that in the future colleges involved in career pathways building could do more to raise awareness among employers and the community of what it has achieved in advanced manufacturing training and of the value of the certificates the students have obtained. It also suggests a need for more sustained resources dedicated to expanding reach to a broader network of employers and to deepening relationships with those that offer true potential for advancement to their completers.
- **Utilizing temporary grant staff members created sustainability challenges.** MWCC avoided the high staff turnover and staffing shortages reported by the other consortium colleges by appointing much of the grant-funded staff as temporary and adjunct positions. Although this strategy was successful in minimizing turnover, it may be less than ideal from the perspective of sustainability because once the grant is over the positions disappear. A balanced strategy, where most grant positions are temporary but a few key personnel are hired permanently, might allow for both low staff turnover and program sustainability.
- **The large number of relatively small manufacturing firms in the region made employer engagement more challenging.** Although the region is strong in advanced manufacturing, it is also made up of many small employers. This is a challenge for employer engagement because it requires more time and energy compared to engaging only a few larger employers. MWCC reacted to this challenge by connecting to regional employer associations such as the Business Roundtable; it gained additional exposure to many small companies in this way.

## CHAPTER 4: BOSSIER PARISH COMMUNITY COLLEGE

Bossier Parrish Community College (BPCC) is a two-year technical college located outside of Shreveport-Bossier City in northwest Louisiana. With an average enrollment near 6,000 for the entire college at the time the study was conducted, BPCC marketed itself as a regionally innovative workforce training and continuing education institution that had strong ties with the nearby Barksdale Air Force Base and industry partners.<sup>21</sup> BPCC operates a single campus out of a new (2004) complex adjacent to Shreveport-Bossier City. The college has a faculty of 140, and offers 41 degree programs, with an additional 50 certificate and technical competency area (TCA) programs.

Overall, the college accomplished most of the objectives assumed under the grant. As part of AMMQC, BPCC developed functioning and sustainable career pathways within mechatronics credit-based programs, built significant new employer partnerships, developed simulation software for teaching Programmable Logic Controllers (PLCs), and leveraged successes from AMMQC to secure additional grants. The college's main challenges in implementation consisted of staff turnover and incomplete bridges between noncredit and credit programs.

This case study describes the economic context for implementation in Northwest Louisiana, analyzes how the institutional context shaped implementation, reviews how the college implemented the key components of the TAACCCT grant, and addresses sustainability and overall impacts.

### Economic Context

The region of Northwest Louisiana incorporates eleven parishes situated around the city of Shreveport. The region is not well known for manufacturing, which represents just under 10 percent of the regional labor market.<sup>22</sup> However, manufacturing is diversified, with at least 35 manufacturers operating within 19 different manufacturing sectors, including fabricated metal, non-metallic mineral, machinery, and chemical manufacturing. Most employers in the area are mid-sized, with about 100-150 employees. One employer interviewed for the study summarized the status of manufacturing: "There is a lack of manufacturing knowledge as a whole; we are not a [major] manufacturing area." The region's economy has been affected by recent downturns in oil and gas production. However, the state has taken aggressive steps through Louisiana Economic

“

*There has not been a lot of expansion, there has not been anything new really coming in so there's been just kind of a slowing [of the regional economy in general] ...a lot of that has to do with the fact that [it] affects everything...oil and gas affects the manufacturing which affects retail which affects everything [else]. So, our whole economic system has been affected because of the huge downturn in oil and gas.*

*-Regional Program Manager*

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<sup>21</sup> <https://www.bpcc.edu/aboutbpcc/introduction.html>.

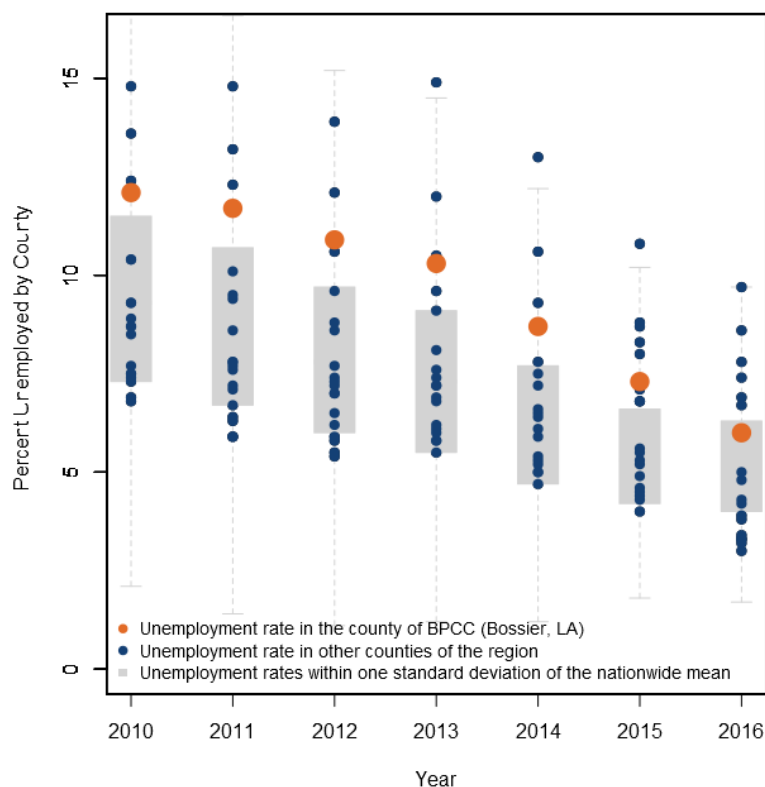
<sup>22</sup> The region includes all parishes within 50 miles of the college. Source: Bureau of Labor Statistics, Quarterly Census of Employment and Wages.

Development (LED) to attract new businesses, as shown later in this chapter.

Overall, the economy in Northwest Louisiana grew after the 2009 economic recession, as evidenced by higher overall employment numbers and lower rates of unemployment (see Exhibit 4-1 below). However, many of the occupations for which AMMQC planned to train its participants were connected to the oil and gas sector, which, although it had been growing significantly before AMMQC was launched, subsequently declined.<sup>23</sup> This constituted a challenge for grant implementation at BPCC, because the decline in oil and gas production suppressed the demand for labor in the targeted manufacturing sector.

Much of the impetus behind the initiation of the AMMQC project at BPCC was provided by Benteler Steel (a large German manufacturer) establishing a manufacturing facility in the area in 2012. The move was in response to the previously mentioned expansion in the shale oil and gas industry. Benteler Steel chose the Shreveport area after examining 100 different locations in 13 states,<sup>24</sup> and was attracted to the region by a competitive package assembled by the state that included the construction of a training facility at BPCC (which was later used to house AMMQC).

**Exhibit 4-1: Unemployment Rates in Counties of the Bossier Parish Community College Economic Region, 2010 – 2016**



Source: Bureau of Labor Statistics, Local Area Unemployment Statistics, 2017.

<sup>23</sup> The decline was due to lower energy prices nationwide and was not anticipated at the start of the grant (Wellborn, 2015).

<sup>24</sup> Bossier Press (2015).

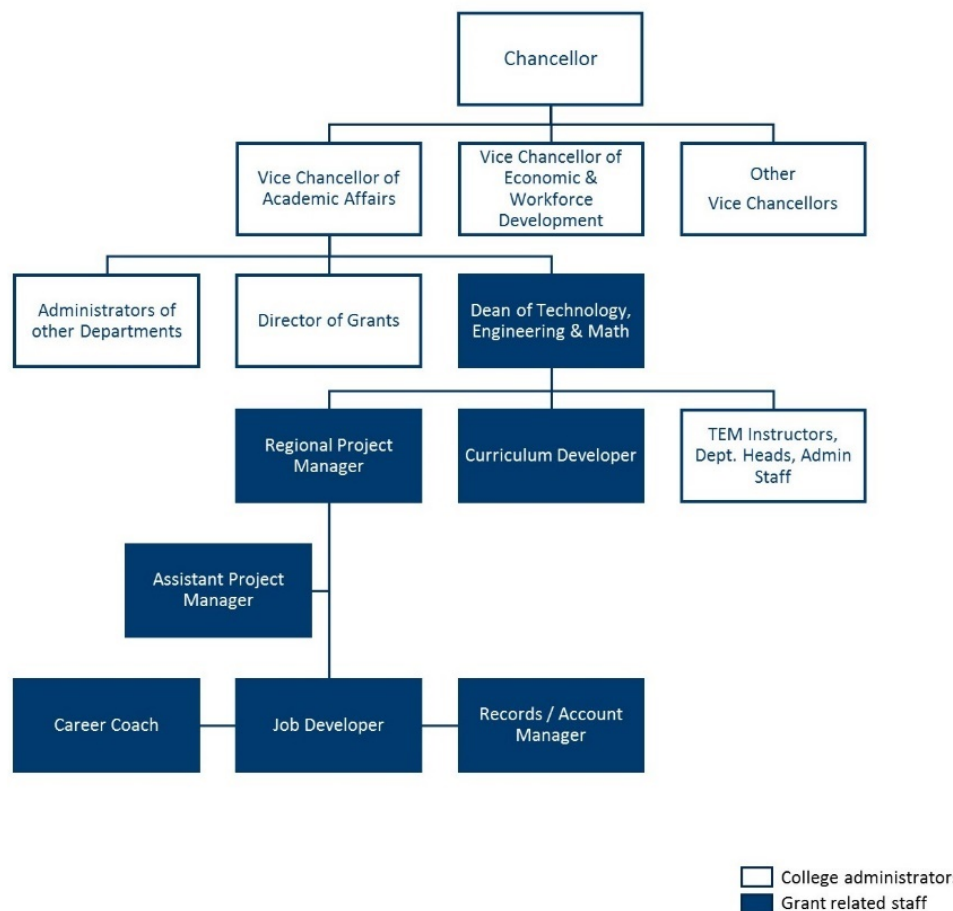


## Institutional Context

Throughout grant implementation, college-level governance at BPCC was stable. The AMMQC grant was housed in the College of Technology, Engineering, and Math (TEM)—a for-credit division of the college. The dean of TEM reported to the vice chancellor for academic affairs, which oversaw all the academic divisions of the college. In turn, all vice-chancellors reported to the college chancellor. In practice, this meant that communications between the TEM dean and college chancellor, rather than being direct, went through the vice chancellor for academic affairs.

The dean of TEM began her work in this position in early 2014, just as the grant was beginning. She served as the primary liaison between grant program staff members and other parts of the college. The college's interim director of grants worked in parallel with the TEM dean and contributed to the writing and execution of the grant as well as previous and subsequent TAACCCT grants awarded to the college.

**Exhibit 4-2: BPCC Grant Organization Chart**



BPCC's involvement in the AMMQC initiative was part of a larger strategy to develop the technical and manufacturing programs within the TEM Division, and it was accomplished in coordination with other grants and initiatives. The college also received TAACCCT 2 and TAACCCT 4 grants (targeted to IT cyber-security programs and welding manufacturing, respectively) and WIOA Rapid Response funds from the state totaling \$1.5 million. BPCC also received a Workforce Initiatives for Northwest Louisiana (WINLA)

grant funded by the National Fund for Workforce Solutions. These grants provided equipment and/or functioned as leveraged resources for AMMQC. For instance, WINLA provided case management and career counseling services through Goodwill early on, as well as a “boot camp” program to help students pass remedial courses; additionally, the initial equipment for the program was purchased through WIOA Rapid Response.

In addition, BPCC had a strong partnership with Louisiana Economic Development (LED), a state economic development agency whose mission is to attract business and investment to the state, as well as coordinating regional economic development activities between business and state-funded services. LED operates a regional office on campus at BPCC, which is housed in the TEM building. This close relationship yields unique benefits for AMMQC employer engagement activities, as employers frequently visit the campus for LED-focused events.

“

*LED recognizes our role and how we can help employer partners, how we can assist the state and the economy, which is really interesting. It's not us [BPCC] against them [LED]. They really do see us as part of the ecosystem on how we can help the economy.*

- Dean of TEM

”

## Grant Implementation

Key components of grant implementation included staffing, recruitment and intake, student support, curriculum development and articulation, equipment upgrades and hands-on learning, online learning, and job placement.

### Grant Staffing

BPCC set up a staffing structure that initially included a regional project manager, an assistant project manager, a career coach, a job developer, a curriculum director, and a grant accountant/records manager. The regional project manager oversaw the day-to-day administration of the grant and reported to the dean of TEM. The assistant project manager and the career coach were intended to conduct intake and recruitment activities, and the job developer was tasked with employer engagement activities. AMMQC also funded instructional time for two faculty members. One of these faculty members was the curriculum director, who developed new curriculum, advised on equipment purchases, and oversaw the development and integration of simulation software. The curriculum director also attended regional advisory board meetings and interacted with employers.

The regional project manager convened weekly meetings with all grant-related staff members. All grant staff members and most grant-related staff offices were in the same building, which led to frequent informal meetings among those engaged in the initiative.

There was substantial turnover among grant program staff members over time. The first regional project manager departed half way through the grant period and was then replaced by the assistant project manager. The new regional project manager reflected on the challenges of transitioning and the support she received from her colleagues:

*The biggest [part of transitioning into the manager role] was trying to get acclimated to everything that was going on and everything that I needed to know very quickly. That was probably the hardest part.... Luckily, I had good people around me that were here to help.*



-Regional Project Manager

In addition, the grant accountant/records manager position turned over often, and the career coach role was filled for just over one year, with the job developer and other staff members absorbing its responsibilities after the career coach left the project. The staff members who remained did their best to cover the work, but there were often substantial difficulties:

*A while ago we had the career coach work groups, and when we got a career coach for our grant – in the beginning, we didn't have a career coach, so I kind of filled in and did that. But when we got a career coach, then I let her do that and then I focused more on the recruiting aspect of it.... Now we're back to where we started...We've hired an assistant grant director to take that on, but I do plan to step back up and help.... I just have to do it.*

-Job Developer

This high level of turnover, while not unusual for a grant-funded project, slowed down grant implementation due to the inefficiencies associated with training new staff members for their roles within a relatively short period of performance for the grant (three years) and inadequate staff time to execute all the key components of a career pathways model, such as the intensive student support required for effectively serving adult learners and other individuals with barriers.

### **Partnerships**

When AMMQC started, BPCC's partnerships with economic development agencies were relatively well-established. LED was already located on-site and had engaged the college in high-level discussions about regional economic development strategies. Employers reported in the employer survey and focus groups (see Appendix B) that having the economic development agency on-site was an incentive for them to engage in AMMQC activities, insofar as it enabled them to conduct networking with the state and other employers.

In addition, BPCC expanded the employer relationships and contacts established under the TAACCCT 2 grant. The stability in the job developer position meant that BPCC could forge relationships and translate employer needs into innovative recruitment events such as the resume café (see below), which in turn enabled BPCC to initiate contact with new employers.

The college established a regional advisory board to provide feedback and guidance on course content, as well as to open additional avenues for dialogue between the college, employers, and regional workforce entities. The regional advisory board covered all the grant-funded projects administered by TEM (not just AMMQC), and met less often than the grant advisory boards created by MWCC and NCSC (annually compared to quarterly). The BPCC cross-grant regional advisory board supported systemic thinking and better leveraging of resources among projects. The relatively infrequent meetings did not seem to affect employer partnerships since, as mentioned before, BPCC was already seen as a hub for connecting employers and state agencies.

### **Recruitment and Intake**

Over the course of the grant, BPCC used a variety of strategies to recruit students. It made presentations at high schools, chamber of commerce meetings, partner meetings, and rapid response sessions; posted program materials at the local job centers; placed ads on the radio, arranged for a representative to appear on a local news program, attended career events (career fairs, expos, etc.), and shared program

information with employers. According to the job developer, the most effective recruitment strategies were the radio and local television advertisements.

Despite these outreach efforts, grant staff members found it challenging to recruit students for credit programs. Respondents reported that manufacturing is often perceived in the region as dirty and not particularly glamorous work:

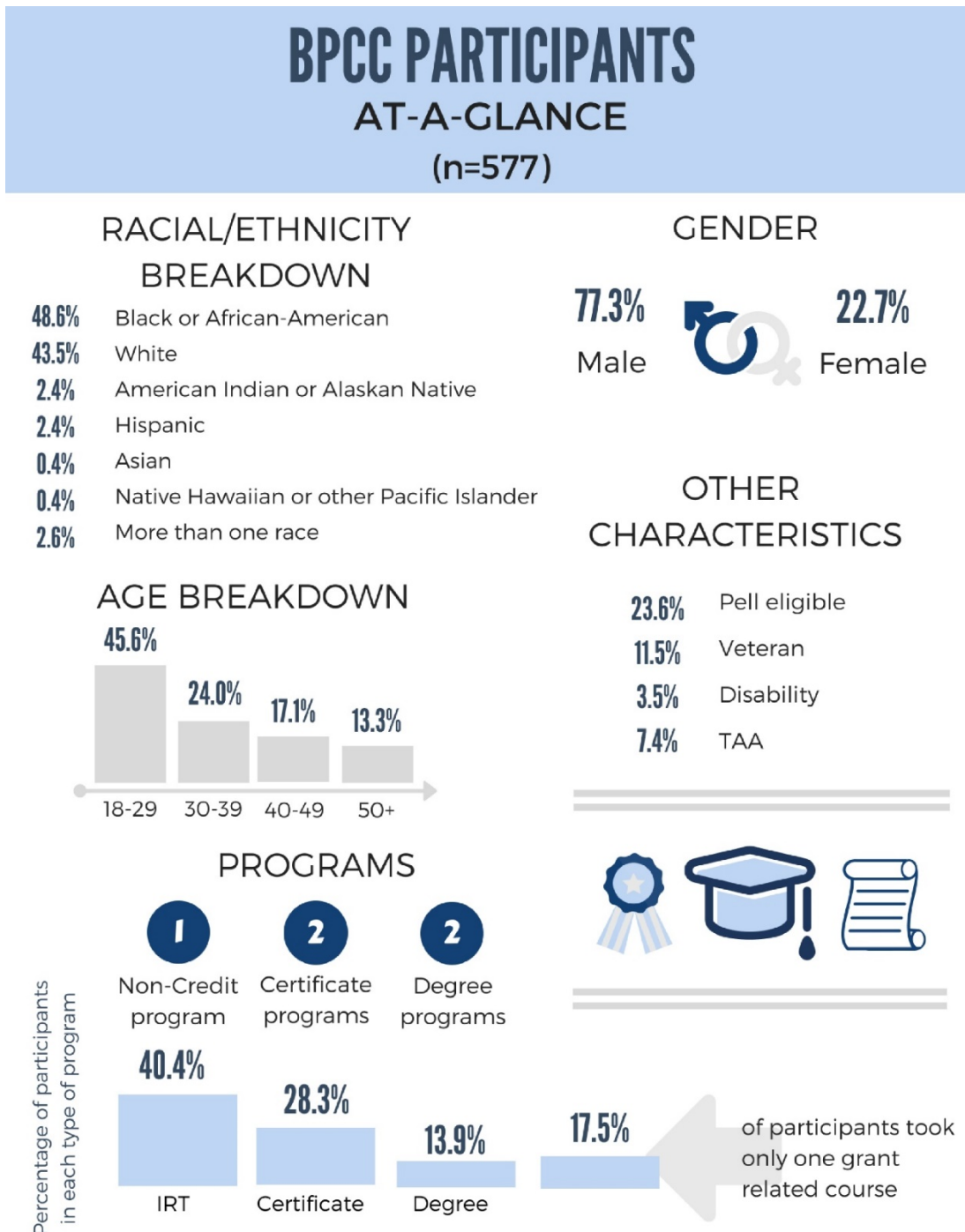
*When you talk about manufacturing, people automatically assume that it's dirty, it's grimy, it's hot. So, we're really just changing the perceptions...about what they've seen on TV or maybe what parents or family members have told them. [We're letting] them know that manufacturing has evolved. It is advanced and we're needing individuals that know how to troubleshoot and repair machines more than do the manual, physical labor.*

*-Job Developer*

During the first half of the grant term, AMMQC used grant funding to develop only credit programs, and recruitment efforts targeted individuals who qualified for enrollment in the college. Entry requirements included possessing a high school diploma or GED and obtaining a passing score on an “Ability to Benefit” exam. This type of assessment was likely to screen out individuals who needed skills remediation, were nontraditional students, or who had significant barriers to employment. Therefore, the pool of credit participants was likely to consist of more traditional students and students with higher proficiencies than those who entered the noncredit Industrial Readiness Training (IRT) program, which did not exist until more than a year into the grant period.

Beginning in the second half of the grant period, BPCC expanded recruitment efforts for the IRT. The college established partnerships with a local employer (Frymaster) and two staffing agencies that the company used to recruit workers. BPCC customized the IRT program to emphasize the specific skills that Frymaster required. The staffing agencies referred people in their candidate pool to BPCC’s IRT training; after they completed the course they were referred by BPCC back to the agencies. The agencies then facilitated an employment application to Frymaster.

The graphic on the next page summarizes the demographics of AMMQC participants at BPCC. In total, BPCC officially enrolled 476 students into grant-funded programs, and an additional 101 credit students in other programs attended a course created by the grant. AMMQC participants were almost equally split between credit (243 participants) and noncredit programs (233 participants). The participants were predominantly male (77.3 percent). Close to half (45.6 percent) were under 30 years old, and over two-thirds (69.6 percent) were under 40. Forty-nine percent of participants were African-American, and 43.5 percent were white.



### Student Support

In general, the student support staff (career coach and job developer) at BPCC kept an “open door” policy for students and were housed in the same building where most of the courses were taught. Therefore, student support staff members could communicate frequently with students who required assistance.

The student support services that focused on job search were very strong at BPCC, at least for participants enrolled in credit programs. In principle, noncredit (IRT) students had the same access to student support services as students enrolled in credit programs. However, since the IRT instruction was held typically off-campus, drop-in and informal contact with grant-funded support staff members was more limited for these participants, and noncredit students did not typically participate in employment-oriented events such as resume cafés. Staffing agencies that recruited IRT program participants typically provided job search assistance and placement support to these participants.

### **Innovative Student and Employer Hiring Events**

The Job Developer at BPCC created a series of events for students and employers to help transition students from training into employment more smoothly: Resume Cafés, Sales Calls, and Speed Interviews.

**Resume Cafés:** The Resume Café is an hour-long event where each student has the opportunity for five staff members or employers to review his or her resume one-on-one. Students are required to participate to attend the Speed Interview event.

**Sales Calls:** The job developer built relationships with human resources representatives from manufacturing companies in the region by conducting regular “sales calls” to employers. On the calls, she encouraged the representatives to attend the Resume Cafés and Speed Interviews, and to make presentations to students at the college.

**Speed Interviews:** Similar to “speed dating,” the job developer invited employers and students into a room and they rotated around the room conducting 15-minute interviews. It allowed employers to interview 20 candidates and students to meet up to eight employers in one day.

The job developer contacted all the students enrolled in credit programs to arrange an initial one-on-one meeting that was aimed at updating students’ resumes. At the end of each semester, students who participated in resume preparation were invited to participate in speed interviews (see text box above). The job developer also arranged for various employers to make regular presentations about their companies to students. The students who participated in these events had glowing reviews:

*We were walking out of class after the resume café, and [the career coach] said, “[the employer] loved your resume, to let you know.” I’m like, “Oh, okay.” She [the career coach] is always there, coming by and checking on us, and then trying to encourage, which to me it’s just motivating. It makes me glad I’m here.*

-Student

*Where are you going to go and get eight interviews with eight very well-known companies in the local area at one time? So, I feel very blessed I got the opportunity.*

- Student

*I really liked the speed interviewing, which allowed us to get to know the advanced mechatronics students.*

- Employer

Despite the success of these innovative approaches aimed at connecting students with employers, BPCC staff experienced some challenges in implementing them. The job developer reported some challenges in getting students to come to the speed interviews, which seem to originate in some students' apparent lack of motivation:

*Here's the real challenge: getting the students to come. That's a whole other ballgame, and that's my biggest [challenge]. You should not have to convince them, but you would be surprised that I've had to convince people to participate in the speed interviews, and these are for actual jobs, not for mock interviews. And we have, each semester, a number of students that just don't participate; or if they do participate, just don't take it seriously.*

*-Job Developer*

### **Curriculum Development: Noncredit Programs**

At the start of the grant, the BPCC grant team focused more on developing credit programs than the noncredit IRT. This decision was made by the grant staff for several reasons. First, grant administration was housed within the credit division of the college and there was already significant curriculum development (from previous grants) that the grant team was eager to finalize. Second, there had been a previous attempt to implement an IRT program within the noncredit division (workforce development), but some of the partners involved were disappointed with the low enrollment in the program, which they attributed to its high cost and considerable length. Even after the grant team did launch the IRT, late in the second year, the team struggled to find the right combination of content and duration and it ended up designing three different models in rapid succession.

As shown in Exhibit 4-3, the program became shorter from its first iteration to the third and progressively more employer-driven. Partnerships with local temporary staffing agencies helped with recruitment. By the end of the grant period, almost half of all grant participants were enrolled in IRT. However, most of these participants were referred by the staffing agencies and were seeking rapid employment rather than a pathway into credit programs. Thus, although the IRT training was successful in connecting people who were already close to being job-ready to rapid employment in entry-level, lower wage jobs, this component did not function as a gateway to further advancement along the career pathway—the way it was conceptualized in the grant proposal. Grant staff members tasked with student support stated that before the end of the IRT program, they typically provided students with information on how to enroll in credit programs at the college. However, based on administrative data received from the college, it appeared that no grant participants transitioned from AMMQC noncredit to credit programs during the grant period.

#### Exhibit 4-4: Variants of IRT training at BPCC

At the end of the grant, BPCC was still looking for additional employers for which to develop customized

Year Implemented		Length of course	Typical Location	Course Content		Marketed to...	Primary student demographic	Certification
IRT 1	2012	6 weeks (~80 hrs)	Likely BPCC campus	Generalized soft skills	Basic technical skills	Community (students, schools, AJCs, etc.)	Anyone 18+, particularly under / unemployed adults	Unknown. Possibly OSHA
IRT 2	2015	5 weeks (~30 hrs)	Shreve Memorial Library, Shreveport, LA	Generalized soft skills	Basic technical skills	Community (students, schools, AJCs, etc.)	Anyone 18+, particularly under / unemployed adults	OSHA 10
IRT 3	2016	1 week (~25 hrs)	Frymaster	Selected soft skills	Basic technical skills at employer	Frymaster / temp agencies	Temp Agency clients	OSHA 10
IRT 4	2016–2017	3 – 15 days (hours vary)	Employer site	Selected skills from employer		Employers	Incumbent workers	OSHA 10

programs in the mold of IRT 3. At the time of writing this report, however, it was unclear whether such employers had been identified and the level of buy-in at the college for IRT programs was still low enough that they were unlikely to be sustained after the grant.

#### Curriculum Development: Credit Programs

In contrast to the implementation process for IRT programs, the development and approval of relevant credit courses began very soon after the TAACCCT grant was awarded, owing to a significant level of pre-grant planning. This resulted in a relatively fast implementation of credit programs compared to other consortium colleges—the stackable Advanced Manufacturing and Mechatronics programs were all approved and running by the end of the first year of the grant. The typical curriculum approval process involved course development by faculty and staff members, review (from employers and the college curriculum committee), and approval by the dean of TEM and the Board of Regents at the college.<sup>25</sup>

<sup>25</sup> Note: The courses were also aligned with C4M, a state-recognized certification, which added an additional layer of approval from LED, the state economic development agency. Once those were approved, subsequent new courses were not aligned to C4M because staff found the dual alignment with C4M and MSSC CPT to be too confusing and cumbersome to continue.

#### Exhibit 4-5: New Stackable Curriculum in Advanced Manufacturing and Mechatronics



Consistent with the career pathways approach in AMMQC, BPCC organized credit programs in Advanced Manufacturing and Mechatronics into a stackable series. The series progressed from a semester-long Technical Competency Area, to a one-year Certificate of Technology Studies, to a two-year Associates Degree in Industrial Technology (see Exhibit 4-4). All the credit programs developed under the aegis of AMMQC were new. The one-year certificate is aligned with the Certified Production Technician (CPT) certification offered by the Manufacturing Skill Standards Council (MSSC) and Siemens Level I certifications. The two-year Associate's Degree is aligned with Siemens Level II and the National Center for Construction Education and Research (NCCER) certificate in Instrumentation, Pipeline, and Safety Certifications. The AMMQC grant directly impacted how these new course sequences were aligned with industry-recognized credentials.

#### Articulation and Career Pathways

As noted above, although the credit programs developed through the grant are fully stackable, the BPCC grant team reported that the transition of participants from noncredit to credit programs (one of AMMQC's goals) did not materialize as intended in the original grant proposal. There are several possible explanations for why noncredit-to-credit bridges were slow to implement at BPCC. First, grant staff members and administrators reported that the college placed a strong value on the development of credit programs, as they were perceived as offering better skill development and being more sustainable compared to noncredit programs. This hypothesis is supported by the fact that the administrators decided to house the grant in the credit division at the college in the first place, rather than in the Division of Economic and Workforce Development (or in a combination of the two). Second, the college's strategy to become a hub for economic development (through its partnership with LED) and its focus on implementing industry-recognized credentials through those partnerships speaks to a desire to equip grant participants with portable skills (since credit programs are more easily recognized by other higher education institutions compared to noncredit credentials). The heavy focus on credit



programs meant that the grant team had relatively less time to focus on the development of noncredit programs and bridging them to credit programs.

Overall, this suggests that career pathways approaches are difficult to implement due to their complexity. Therefore, it is understandable that some components of AMMQC were better executed than others at BPCC, and there are lessons to be learned from these implementation challenges for future career pathways policy efforts. For example, the three-year duration of the grant may have been unrealistic for enacting the types of institution-wide, systems-level changes that a career pathways approach may require in practice. In addition, the debates over the content and value of IRT programs at BPCC (as reflected by the multiple iterations of the program) highlight the inherent challenges of trying to balance an employer-driven training program that produces candidates ready-to-work with the mission of colleges to be accessible to individuals who are nontraditional students and who have multiple barriers to employment.

### *Online and Technology-Enabled Learning*

BPCC used AMMQC grant funding to make significant upgrades to the equipment used for training in credit courses. Much of the equipment was purchased during the second year, and was in use by the third year of the grant. Equipment was selected based on discussions with the employer advisory board, and instructor input was considered. According to instructional staff members, mechatronics trainer systems, manual milling equipment, and mechatronics troubleshooting software substantially enhanced the quality of instruction.

During focus groups, students expressed satisfaction about the hands-on learning made possible by the new equipment:

*I'm the type of person I can read it all day long and I don't really get it, but you put me in hands-on, and you show me hands-on and I will pick it up like that. We were kind of stuck reading the book, and I was like, "I hate it. I'm so lost. I'm so confused. I do not get this at all." Then when we came over here and we started the labs, and I could actually see what I was working with and put the words with hands-on, and I got it instantly. So that really helped a whole lot.*

#### **Equipment Purchased through AMMQC**

- Portable electrical & pneumatic learning systems
- Plastics tech learning systems
- Concept Mill
- 8 Portable PLC Learning Systems
- Jet Mill
- Compact PCs with Siemens PLC and HMI software (purchased with a cost-sharing arrangement under another grant)
- Flexible Manufacturing System Trainer
- Vertical Band Saw
- Horizontal Wet Band Saw
- Engine Lathe
- 21 computer mounts & computer monitors



-Student

*I was in an interview...and I was asked three different things...They asked me what five inch was. I was able to tell them because of this course. They asked me what Lockout-Tagout is. I was able to tell them because it's in the course. They asked me about PPE. I knew a little bit about it, but sometimes you've got to know how to word it. I was able to speak to that.*

-Student

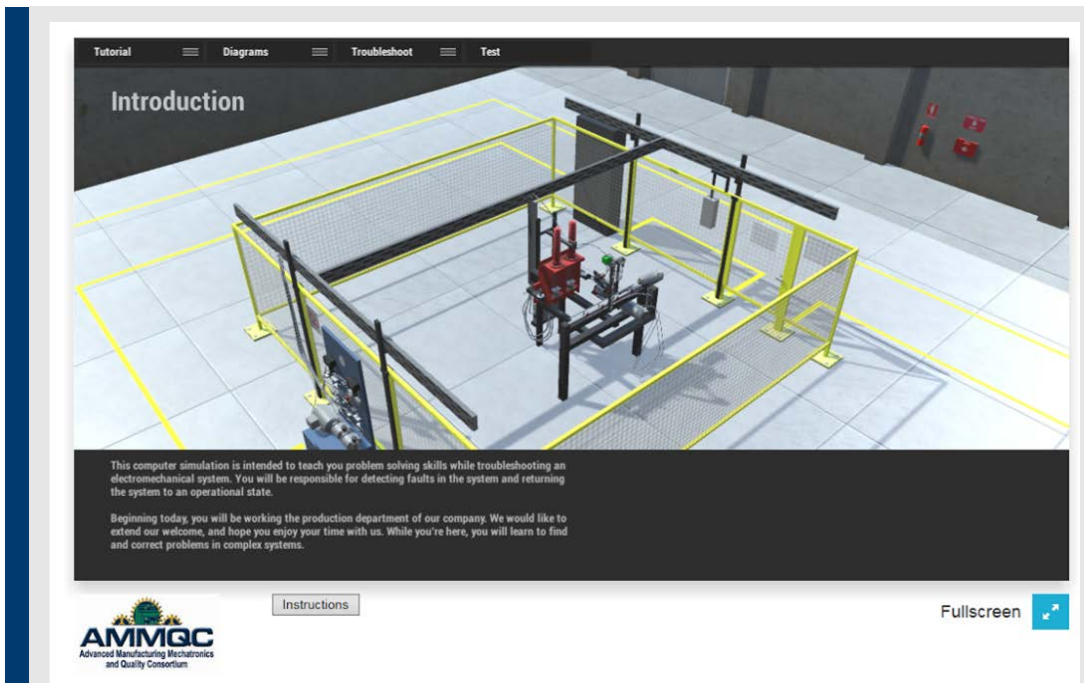
One of the key strategies of AMMQC was to create massive open online courses (MOOCs) whose function was to “serve as an outreach and recruitment tool to educate individuals on these career fields and encourage them to enroll in an AMMQC program”.<sup>26</sup> Because BPCC’s developmental and remedial courses, across the entire institution, were offered as MOOCs that were available free of charge, the college took responsibility for leading the grant-funded effort to develop online versions of four manufacturing courses (AMFG 100, 102, 104, & 106) required for the Certificate for Manufacturing (C4M). These courses introduce manufacturing terms and safety within the following topics: Introduction to Manufacturing, Quality in Manufacturing, Basic Hydraulics, Basic Pneumatics, Basic Electricity, Basic Welding, Robotics, and Metals in Manufacturing. This content is currently accessible at an independent learning site that can be accessed by individuals from all four AMMQC areas ([https://www.coursesites.com/webapps/Bb-sites-course-creation-BBLEARN/courseHomepage.htmlx?course\\_id= 411869 1](https://www.coursesites.com/webapps/Bb-sites-course-creation-BBLEARN/courseHomepage.htmlx?course_id= 411869 1)). Although these MOOCs can be considered as fulfilling the commitments from AMMQC’s workplan, BPCC did not have any information about how the courses were being used.

A significant achievement of the grant was the creation of an online software simulation that is aimed at teaching problem-solving skills while troubleshooting a mechatronics system (see Exhibit 4-5). To build the simulation, BPCC hired a software developer to upgrade a simulation developed by the German manufacturer Siemens in the 1980s. The software developer hired by BPCC updated the training to modern standards and equipment (procuring additional content development from a third-party company) and integrated the new training content into courses. For example, this content is integrated into the curriculum for AMFG 260, and was uploaded to SkillsCommons.org.

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<sup>26</sup> AMMQC Workplan.

#### Exhibit 4-6: BPCC's Programmable Logic Controllers Simulation



The simulation developed by BPCC was one of the most important accomplishments of the college under the grant. This virtual software is essentially an interactive game that allows students to gain hands-on exposure trying to problem-solve with Programmable Logic Controllers (PLCs). It can be used by students when they are not physically present at the college (which is often the case with nontraditional students). PLCs are a foundational component of automated production systems, because they function as the “brain” of an automated assembly line. To use them, an individual needs to know basic safety procedures and how PLCs function; he or she also needs skills in problem solving, logic and math, and basic computer programming. The staff designed the PLC simulator not only to teach introductory skills and allow students more time to practice, but also to leverage the video-game approach to stimulate interest in manufacturing and trades programs among young people and others who like to play video games and could learn how to apply related skills to a job.

In the beginning of the game, the user enters a room that has a failing PLC system. The user is directed to figure out the correct order of operations to solve the problem, and if they succeed in restoring the system to a normal state, they advance to a more complicated problem. The simulation places the student in front of a real system used in manufacturing and gives students a safe environment in which they experience real possible hazards and complications of the manufacturing floor. The simulator can likely be further enhanced in the future with newer technologies such as virtual reality software and software accessible on a mobile device.

Creating the virtual simulation was also associated with some challenges. First, the college’s internal procurement process made it difficult to purchase third-party services from the software vendor. Second, developing the application was considerably expensive. In terms of usage, while the application

was being used widely at BPCC, it was not widely deployed across the consortium colleges within the grant period, mostly because the course content is relevant to Siemens' certification, which other consortium colleges did not always offer. Nevertheless, much can be learned from BPCC's efforts to pilot and build out the software. Because the field of education is moving in the direction of online learning and gaming technologies, it shows BPCC's willingness to experiment and advance the field.

## Sustainability

The most sustainable components of AMMQC at BPCC were the new credit programs with their stackable credentials, the newly purchased training equipment, the alignment of programs to industry-recognized certificates, and the employer partnership.

The AMMQC-developed credit programs will likely be one of the most lasting components of the grant, in part because they fit within a long-term strategic vision at the college to update its academic programs in advanced manufacturing. Their likelihood of sustainability is also increased by their nesting within the TEM Division, which already supports popular program concentrations in related fields. New and updated classes serve other academic tracks while meeting the grant objectives.

Although BPCC enjoyed strong relationships with employers before the grant, AMMQC-related activities strengthened and broadened partnerships with employers, and these are likely to continue. The student support strategies enacted during the grant further enhanced BPCC's reputation in the region as an academic leader, particularly among employers. Louisiana Workforce Commission representatives interviewed for the study highlighted two of BPCC's employer engagement strategies—the speed interview event and the TEM-hosted career fair—as models for other colleges in the state to emulate. Employers responded well to AMMQC's objectives (several employers reported satisfaction with college-based activities, and the employability of students completing BPCC programs).

*Our company uses a staffing agency to bring people in on a contract basis. We have used the staffing agency to hire several folks from the IRT program and would still use these students. I have no additional job placement suggestions as the college is very willing and flexible in terms of hiring needs.*

*- Employer Survey Participant*

*...we've been using our local resources, BPCC being one of them, to help find good qualified and trained employees and we're working with the university as far as the program and class setup for different types of pieces of advanced manufacturing, and very interested in the students coming through. We've actually hired several students and are continuing to work with and hire more and interview more.*

*- Employer Focus Group Participant*

College administrators have sought to maintain employer relationships since the end of the grant. This was realized through a TAACCCT Round 4 grant focused on welding and several rounds of state-funded grants. In addition, the regional advisory board that meets regularly to advise the college has been instituted for all the programs in BPCC's industrial technology department, not just AMMQC-funded ones. Because of this setup, even as the AMMQC grant ended, employer engagement continued.

Other components of AMMQC were reported as less likely to be sustained. Notable among these are the comprehensive student support model (involving career coaches and job developers) and the IRT programs. The regional program manager, job developer, and other grant staff positions ended with the

close of the grant. It was also not clear how BPCC's noncredit IRT programs would continue. The vice chancellor of the Division of Economic and Workforce Development (BPCC's noncredit division) indicated that her division would like to reinstate its original IRT program after the grant, but that might be difficult because the latest iteration of the IRT was free for students:

*If it was possible [to reinstate our IRT program] we would because it was a good product for us and it was one that was needed locally. We've not had those discussions yet. But it's going to be a little hard to ask somebody to pay for something they've been getting for free.*

*-Vice Chancellor of the Workforce Division*

The curriculum director offered some ideas for continuing IRT programs. One was via a model in which employers pay \$300 to \$400 per student for targeted training. The regional program manager also suggested that the courses could be offered in the future as on-demand online courses. Regardless of the ultimate outcome of non-credit programming at BPCC, the school intends to offer IRT within the TEM Division for at least one year after the close of the AMMQC grant (funded through the TAACCCT 4 grant).

In addition to TAACCCT 4, BPCC recently received a \$2.5 million grant from LED to support the arrival of a large tech company, CSRA, to the region. This funding will also support programs under the TEM Division.

## Conclusion

AMMQC has had a lasting effect on BPCC, most significantly in the areas of curriculum development and employer relationships. These successes have several key drivers:

- the college's position as a regional hub of interaction between employers and economic development agencies;
- previous experience with a TAACCCT grant;
- stable college-level leadership with a strategic vision for using grant-funded initiatives to enhance advanced manufacturing programs;
- innovative student support activities, including the resume café and speed interview, that enhanced employer partnerships and were replicated by other colleges;
- experimentation in new models of course delivery, partnerships, and online technologies, and a willingness to engage in continuous improvement; and
- strong employer partnerships, stemming in part from co-location of the state's economic development agency at the college.

At the same time, the college was confronted with several challenges that were outside its control during the grant period:

- The college is in a region where manufacturing has not been traditionally strong, and where economic recovery has been weaker than in other states.
- The shale extraction industry weakened during the same period that BPCC was preparing students to take jobs in related sectors.

## Key Accomplishments

BPCC can boast of several key accomplishments under the AMMQC initiative:

- **Developed functioning and sustainable career pathways within the mechatronics credit-based programs** through stackable short-term, one-year and two-year credit programs. Courses align to industry-recognized certifications at all levels, and incorporate simulated training through an online educational platform that complements classroom training.
- **Built significant new partnerships with employers**, several of whom hired graduates, attended advisory board meetings, and engaged the college on program developments. BPCC built on pre-existing regional workforce relationships to provide employers with several mechanisms for meaningful involvement in AMMQC. Employers committed to interviewing students who had acquired certificates, participated in career fairs at the college, and attended advisory board meetings to provide feedback on program changes. In designing new programs, significant attention was placed on industry-recognized certifications.
- **Developed simulation software for teaching about Programmable Logic Controllers (PLCs)** by enhancing an old Siemens software package. BPCC was the consortium lead on developing and piloting the PLC simulation software, which was still in early stages of deployment at the end of the grant but showed promise not only for introducing existing students to PLCs but also for stimulating interest among prospective students who enjoy gaming and problem solving but may not have otherwise been inclined to go into manufacturing.
- **Enhanced BPCC's reputation** throughout the state due to the new programs and equipment made possible by the grant. AMMQC was particularly beneficial for the college's partnership with the Louisiana Workforce Commission, which saw BPCC's approach to employer engagement as a model for other colleges to follow.
- **Leveraged successes from AMMQC to secure additional grants.** Based in part on its AMMQC achievements, BPCC has been awarded a TAACCCT 4 grant and new state grants through LED.

Overall, the college accomplished most of the objectives assumed under the grant, and fully embraced the spirit of the TAACCCT program, which was to promote system-level, innovative approaches to career pathways development.

### *Challenges and Lessons Learned*

Despite the relative success of AMMQC at BPCC, the college also faced several challenges when trying to implement the many strategies and components assumed under the grant. Attempts to overcome these challenges sometimes resulted in useful lessons or strategies that might be applied in the future.

- Turnover among grant program staff members contributed to some gaps in student support services, most notably advising and career advice. If the college wins additional grants because of its integrated strategy for promoting advanced manufacturing, that funding might promote a more stable staffing structure.
- The development of noncredit programs lagged significantly behind that of credit programs, and noncredit participants did not benefit from a true bridge linking noncredit to credit programs. As stated earlier, this is partly a result of the college's clear prioritization of credit programs as being more sustainable. The relative separation of noncredit programs within the grant was also a product of the grant being run from the credit division of the college. Seen in a broader context, BPCC's difficulties in this area reflect tensions often found in career pathways development. For non-traditional students and hard-to-serve populations, finding employment and advancing through career pathways are often at odds despite the expectation that career pathways can accommodate working individuals. A potential lesson is that career pathways development is not a linear process, and some components are faster to build than others.

Hard-to-serve populations should be served by career pathways approaches, and future attempts to build bridges might be more effective.

- There were clear differences in vision between the credit and noncredit divisions at the college. Such differences have been observed in other cases, and are well documented in the literature. The literature has highlighted several approaches that might be conducive to more collaboration between noncredit and credit divisions, including joint committees, formal inter-departmental agreements, and stipends or “buy-outs” of time for faculty to teach noncredit courses are some of the methods that can be used to achieve greater integration.<sup>27</sup> The results might include closer alignment between noncredit and credit programs and better quality of teaching.
- There were some initial tensions between the career pathways model of AMMQC, which intends to align programs with nationally-recognized credentials (such as CPT), and the interest of state agencies to promote a state-level credential (C4M). The grant team’s ability to change programs such that they aligned with nationally-recognized credentials rather than the state-sponsored one, without antagonizing state agency representatives, was a promising practice. This was achieved through open communication with employers and agency representatives in regional board meetings and other forums.

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<sup>27</sup> Alssid et al. (2002).

## CHAPTER 5: NORTH CENTRAL STATE COLLEGE

North Central State College (NCSC) is a two-year community college in the Mansfield, Ohio area, which is located between the cities of Cleveland and Columbus, Ohio, roughly one hour's drive from each city. The college enrolls roughly 3,000 students (two-thirds of whom are part-time students) and offers 70 academic programs (leading to associates degrees and certificates) in three divisions—Health Sciences; Public Service; and Business, Industry & Technology (BIT). The AMMQC grant was housed within the BIT division, newly created by the college president around the same time that AMMQC started through a merger of the previously separate Business and Engineering Technologies divisions.

The credit-based business manufacturing training programs offered under AMMQC were housed in the Kehoe Center, which is in a suburban location separate from the main college campus. The noncredit industrial readiness trainings (IRT) funded through AMMQC were offered at various other locations around the area, with the intent of making them more accessible to populations with transportation barriers.

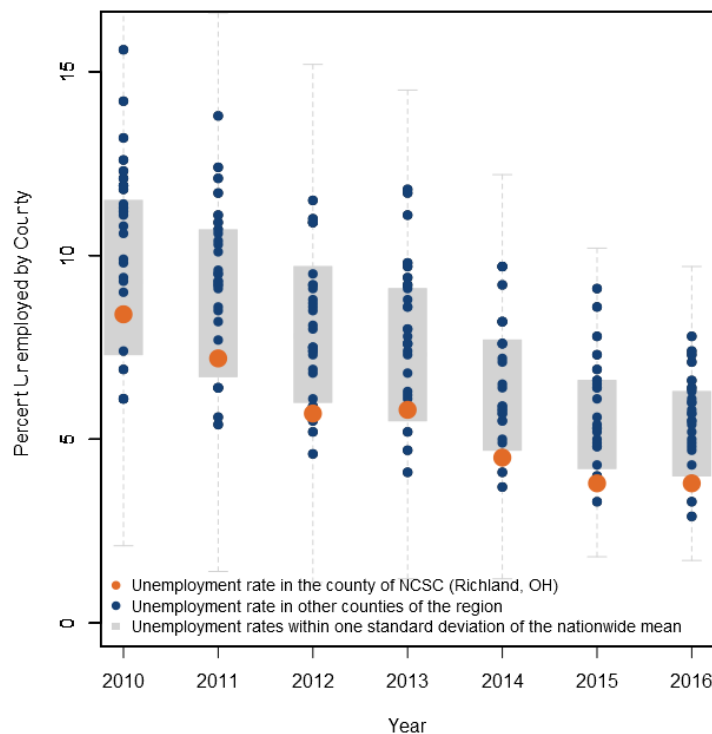
Over the grant period, NCSC made considerable progress in grant implementation, achieved several of its key goals, and experimented with innovative training models. During the grant period, NCSC reorganized existing curricula to make its credit programs in advanced manufacturing more aligned with industry needs, composed of stackable components, articulated to four-year degree programs, and more hands-on. However, NCSC encountered significant challenges—especially in implementing integrated pathways between noncredit and credit programs for adult learners. This case study documents NCSC's key successes and challenges in its efforts to implement the multi-faceted components of the AMMQC model. The case study analyzes the economic and institutional contexts, the implementation process, and sustainability issues to help explain what drove systems-level implementation outcomes and to derive lessons learned for future career pathways efforts at NCSC and elsewhere.

### Economic Context

The North Central Ohio economic region, where NCSC is situated, encompasses 28 Ohio counties that vary significantly in population density. Richland County, in which NCSC is situated, has a population of 124,000; other counties are much more populous and contain the major metropolitan areas of Cleveland and Columbus. This region of Ohio can be characterized as part of the Rust Belt, with a long history of firms focused on supplying parts and tools to the once-robust automobile sector in northern Ohio and Michigan. There has been a long-term pattern of decline in employment and economic growth in manufacturing in the Mansfield area, which is evidenced by abandoned factories and empty and dilapidated homes scattered around town.



**Exhibit 5-1: Unemployment Rates in Counties of the North Central State College Economic Region, 2010 – 2016**



Source: Bureau of Labor Statistics, Local Area Unemployment Statistics. Note: the grey boxes represent unemployment rates within one standard deviation from the mean unemployment rate nationally.

The region suffered high unemployment following the Great Recession of 2007–2009 (Exhibit 5-1). In addition, grant staff members informed us that many of the local business leaders and experienced workers in the manufacturing sector were approaching retirement and there was a limited pipeline of young entrepreneurs and skilled workers in the area to replace them. Inconsistent employer demand and social problems were also listed as barriers to growth. In recent years, the economy of the area has slowly started to rebound. As Exhibit 5-1 indicates, in 2010 more than half of the counties in North Central Ohio reported unemployment figures above 10 percent, but by 2016 every county had dropped below 9 percent. Respondents also reported that there were promising signs of redevelopment and an emergent sense of vibrancy in downtown Mansfield, such as a growing commercial cluster and emerging artistic communities. However, they also reported that the opioid epidemic and poverty continue to take a heavy toll on the community and have made employers wary of hiring people with unstable employment histories. Here’s how the AMMQC career coach described it:

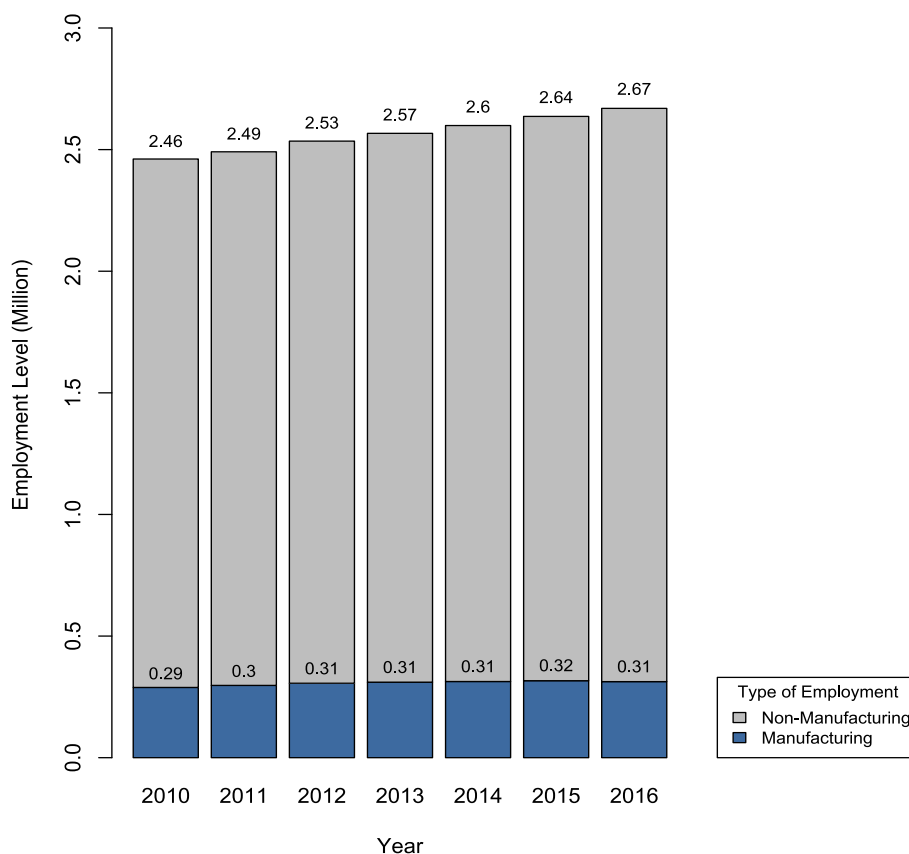
*In our area, we have a huge concentration of heroin [use], I don’t know if you looked at that or you’ve heard the trend but the trend is huge around here. And so, we’ve added [a substance abuse coping skills] component as a part of our [IRT] training, to try to address the issue.*

Compared to the other consortium colleges, the NCSC economic region had the highest proportional share of manufacturing jobs (an average of 12 percent in 2016, and as high as 20 percent in some counties, including Richland). However, the number of jobs readily accessible to AMMQC completers within the designated region may be lower because many students are unwilling to undertake a daily



commute of an hour one-way to Cleveland or Columbus for a job, according to grant staff members. In recent years, employment in the region has been growing slowly but consistently, and manufacturing employment has been stable, resulting in a slight reduction in the proportion of all local jobs that are in manufacturing.

**Figure 5-2: Employment in Manufacturing and in All Industries in the NCSC Region**



Source: Bureau of Labor Statistics, Quarterly Census of Employment and Wages

The manufacturing subsectors in the regional economy include automobile part manufacturing, food manufacturing, plastics, and rubber products manufacturing. The region hosts several mid-sized manufacturers (100–150 employees); many regional employers supply parts to original equipment manufacturers (OEMs) or to first-tier suppliers to them. General Motors was the last major OEM employer in the region, but it closed its local plant in 2009.<sup>28</sup>

## Institutional Context

AMMQC was one of the building blocks in a larger strategic effort by the college to raise funding to support NCSC programs that had lost a major funding source when the General Motors plant closed in 2009. The strategic effort included plans, in the aftermath of the Great Recession, to merge divisions, revamp curricula, and update out-of-date instructional technology. The school pursued AMMQC and

<sup>28</sup> Christ (2009).

other grant opportunities to help fund these institutional goals. Because the college's implementation of this larger reorganization plan resulted in changes that took place around the same time that AMMQC started, it is difficult to determine the extent to which the specific curriculum changes and enhancements in the credit-based curricula were motivated by AMMQC or by the broader college reorganization. Nevertheless, NCSC staff members used the grant funds to emphasize the development of stackable curricula and to expand articulation pathways from certificates to associate degree programs and from associate degrees into four-year degree programs.

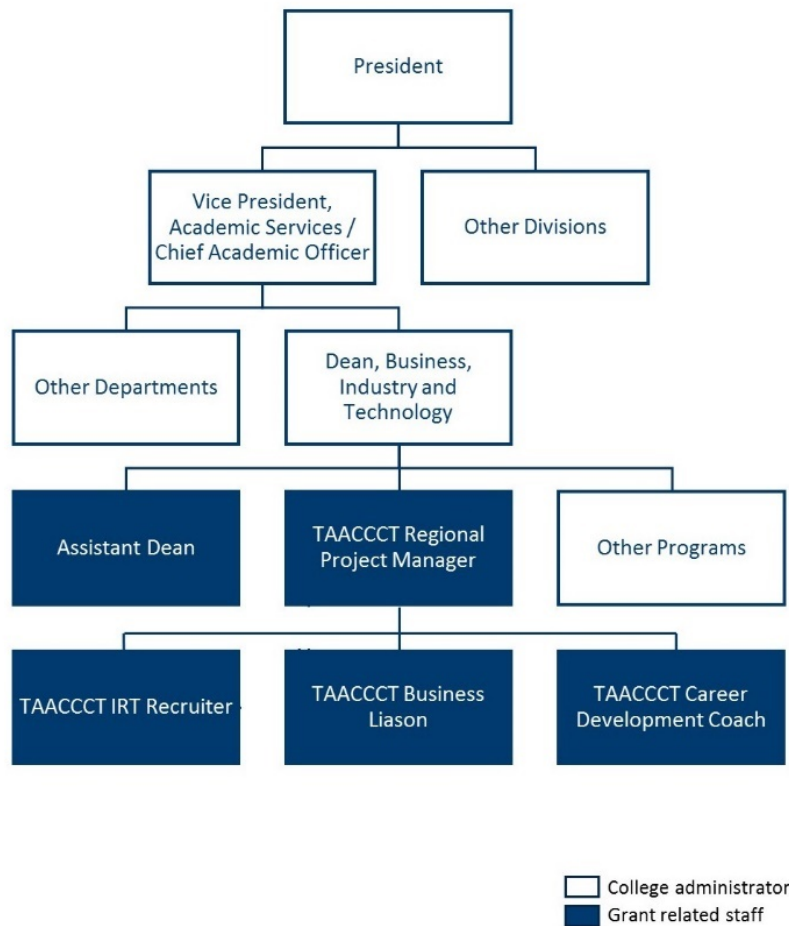
In addition, NCSC was interested in developing the Industrial Readiness Training (IRT) program because, according to grant staff members, the college had not offered noncredit programs specialized in manufacturing for many years. Therefore, AMMQC funding represented an opportunity to improve noncredit program offerings and its relationship with local employers.

The key factors within the institutional context that facilitated AMMQC project implementation at NCSC were stable leadership, the revamping of credit programs after the creation of the BIT division at the college, and the presence of related grants/initiatives. Factors that impeded project implementation were staffing turnover and location of programs.

NCSC operated the AMMQC grant out of the BIT division at the Kehoe Center, and the dean of BIT oversaw grant administration. The grant-funded program staff included the regional project manager, a career coach, a business liaison, and instructors. The career coach at NCSC provided both student support and job search and placement assistance; the business liaison worked on employer engagement and job development. As shown in the organizational chart below, the NCSC regional project manager was about three levels below the college president.

During the grant period, the college-level administration was stable, but there was significant turnover in the grant-funded regional program manager and career coach positions. The most significant change in staffing occurred in the middle of the grant period, when the regional project manager left to take a permanent faculty position and the career coach was promoted to become the new regional project manager (leaving the career coach position vacant for four months).

**Figure 5-3: NCSC Grant Organizational Chart**



The grant staff was housed in a small office in the Kehoe Center, which was conducive to frequent informal communication among the grant team members. The grant team focused most of its implementation effort on the noncredit IRT program, which was a new program to the college and taught in various locations, predominantly off-campus (in contrast to credit programs, which are taught on campus).

## Grant Implementation

NCSC managed to launch the noncredit IRT program quickly because, unlike the reorganization of credit programs mentioned above, designing and approving noncredit programs such as IRT is much easier to accomplish. However, other aspects of grant start-up were slower to implement. Grant staff members reported that it took more time than expected to cultivate relationships with employers, re-activate a relationship with nearby workforce development boards, and obtain buy-in from college administrators to enhance credit programs.

## Partnerships

NCSC strengthened its existing partnerships with employers, workforce agencies, and the local municipal court system because these partnerships were important for implementing the IRT program. New partnerships were less essential for the enhancement of the credit programs or career pathways more generally, and therefore establishing them received less emphasis.

**Employers.** With the start of the grant, NCSC launched a significant effort to build relationships with employers and invite them to serve on the project's regional advisory board. The grant team recruited eight new advisory board members, including representatives of companies such as Gorman-Rupp Company, Bucyrus Precision Tech, Inc., and Stoneridge Electronics. The employers on the advisory board provided input on the design of the IRT curricula and equipment purchase decisions. One employer reported that the advisory board also helped them learn about activities taking place in the region.

**Workforce Agencies.** In the early phases of the grant, members of the AMMQC staff reached out to workforce agency partners in the area. The team worked with local American Job Centers (AJCs) to recruit participants and identify potential employers to engage. For example, they worked with the Crawford County Job and Family Services office to hold information sessions at a local library about AMMQC (which consisted mainly of the IRT program at the time). The partnership with the Richland County Job and Family Services office led to an effort to select more accessible locations for the IRT program to accommodate the adult target population. The partnerships with workforce boards also led to referrals of students between the training program at the college and the placement supports available at the job centers and to participation by additional program partners in workforce development board and AMMQC employer advisory board meetings.

**Municipal Court System.** In the last year of AMMQC, the grant staff developed a new partnership with the municipal court system to refer people to the IRT program. Many people coming out of this system tended to have several barriers to employment, such as substance abuse problems, a long history of unemployment or unstable employment, or a record as a justice-involved individual. The court system felt that the IRT was a valuable service for helping justice-involved individuals learn how to re-integrate into society. At the end of the grant, NCSC was negotiating with the court system on a proposal that would have the courts fund IRT programs after the AMMQC grant ran out to keep that service in place.

## Intake and Recruitment

Due in part to the institutional context at NCSC described above, the process for recruiting, assessing, and enrolling students in AMMQC programs differed for students recruited for noncredit programs and those recruited for credit programs. NCSC recruited students for credit programs largely through the college's normal process for admissions, although in the third year of the grant some participants were recruited from high schools through a special state program called *College Credit Plus*.<sup>29</sup> The grant team enrolled credit participants during their initial enrollment in the BIT coursework.

Recruitment and enrollment for the noncredit IRT program was more involved. The grant team devoted substantial effort to getting the word out about the IRT program in the local community, even though there was not a designated recruitment specialist at the start of the grant. Recruitment strategies included posting flyers at key locations in the community, airing advertisements on the local radio, making presentations at community centers (e.g., high schools, churches, veterans centers) and local

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<sup>29</sup> The high school students were not enrolled in AMMQC until they were over 18, following grant requirements set by USDOL.

community events, and setting up referral agreements with workforce and municipal court partners. According to grant staff members, referrals from a local workforce agency and court system partners resulted in the greatest number of enrollees.

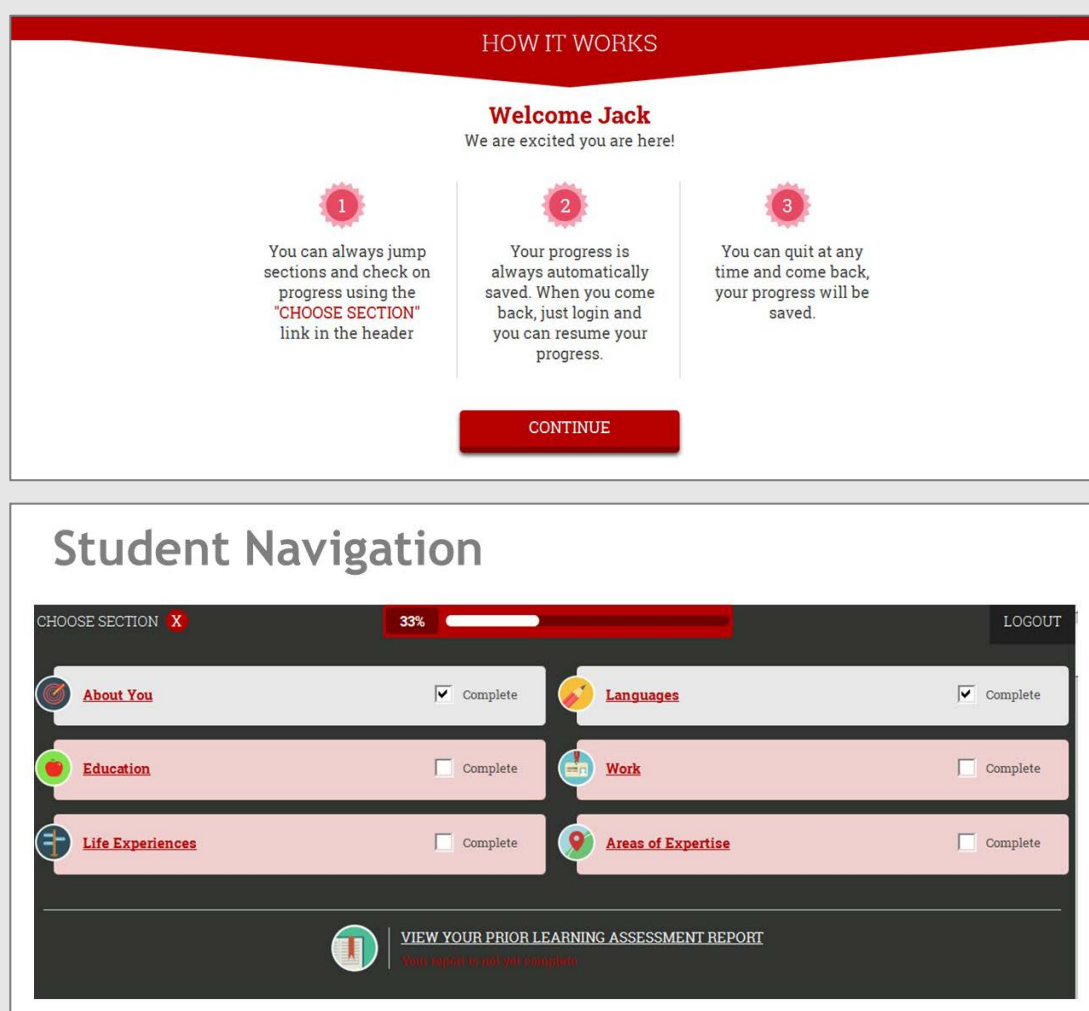
Over the course of the final year of the grant, and with the addition of a recruiter, the project team expanded recruitment efforts for the IRT program, conducting more frequent presentations and other outreach efforts.

Once an individual was recruited for IRT, intake consisted of the following steps:

1. Meet with the prospective student one-on-one, work with the individual to fill out intake forms, and review applications for eligibility.
2. Refer the student to a presentation and workshop during which the career coach goes over program details and conducts a WorkKeys assessment.

During the third year of the grant period, the AMMQC team created and piloted a prior learning assessment (PLA) tool (Exhibit 5-4) that it hoped the college would eventually adopt as part of its advising process for all entering students. Initial implementation was targeted toward TAACCCT related programs only. Although the training and adoption by staff was slower than initially hoped, it appeared that the tool was going to be adopted college-wide by fall 2018.

Figure 5-4: NCSC's New Prior Learning Assessment Tool—a Promising Practice



NCSC partnered with the Council for Adult Experiential Learning (CAEL) to develop an online Prior Learning Assessment (PLA) tool for the college's advising programs called the PLA Accelerator (screenshots pictured above). CAEL defines PLA as "the process for evaluating knowledge and skills to award college credit for learning" done through on-the-job training, independent study, military and volunteer service, noncredit training courses or certifications, and work experience. PLA is a key component of a career pathways system because it helps adult learners complete their education faster and lowers their costs.

NCSC customized CAEL's off-the-shelf PLA assessment so that it aligned with the college's advising process and programs. The goal was for entering students to complete the PLA Accelerator questionnaire online. The questionnaire gathered information about any relevant previous experience or skills that the student might be able to get credit for. The software then produced a report with recommendations, which the advisor would go over with the student to determine whether the student might qualify for PLA credits. That information would also be used to help the student identify training programs that would enable them to transfer their existing skillset more easily.

NCSC had set a goal of recruiting 250 students into AMMQC programs, and about 250 were declared

eligible for the program midway into the grant term. However, because of the emphasis on recruiting populations with many barriers to employment, roughly half of the eligible participants did not actually start training (a phenomenon otherwise known as “no-show”). In the words of one grant staff member,

*[At one recent IRT class] we had 25 [enrolled] but then day one of class maybe twelve showed up....and then [several] flaked out, whether it [was] a couple guys who just felt like they just weren't computer savvy or literate and just would get frustrated and after day one didn't bother coming back. Phone calls were made but [they] just didn't respond. And then I think we had a couple who ended up going to jail, so you have that.*

No-shows were not counted as program participants. To address the loss in enrollment caused by no-shows, NCSC re-invigorated its recruitment efforts in the third year to increase the number of students completing programs (one of the TAACCCT Round 3 performance outcomes).

In total, NCSC enrolled 251 students into grant-linked programs, approximately two-thirds of whom were enrolled in the noncredit IRT program. Exhibit 5-5 summarizes the demographics of student participants in AMMQC. The striking differences between those in noncredit programs and those in credit programs are highlighted in Exhibit 5-5. Over three-quarters of program participants were men, but there were significant differences in the gender breakdown between credit and noncredit participants. Women accounted for almost a third of noncredit participants but only 2.5 percent of credit students. Just over half of the participants were under 30 years of age, with the credit program participants slightly older than noncredit program participants. More than three-quarters of program participants overall were white; African Americans constituted almost a fifth of all participants. The predominance of white students was even more pronounced in credit programs, where almost all the students enrolled were white. Students enrolled in noncredit programs were significantly more likely to have a disability (12.4 percent) than those in the credit pool (1.2 percent). These demographic patterns confirm that NCSC successfully recruited participants from several underrepresented populations into the noncredit IRT program.

Figure 5-5: Characteristics of NCSC Participants in AMMQC

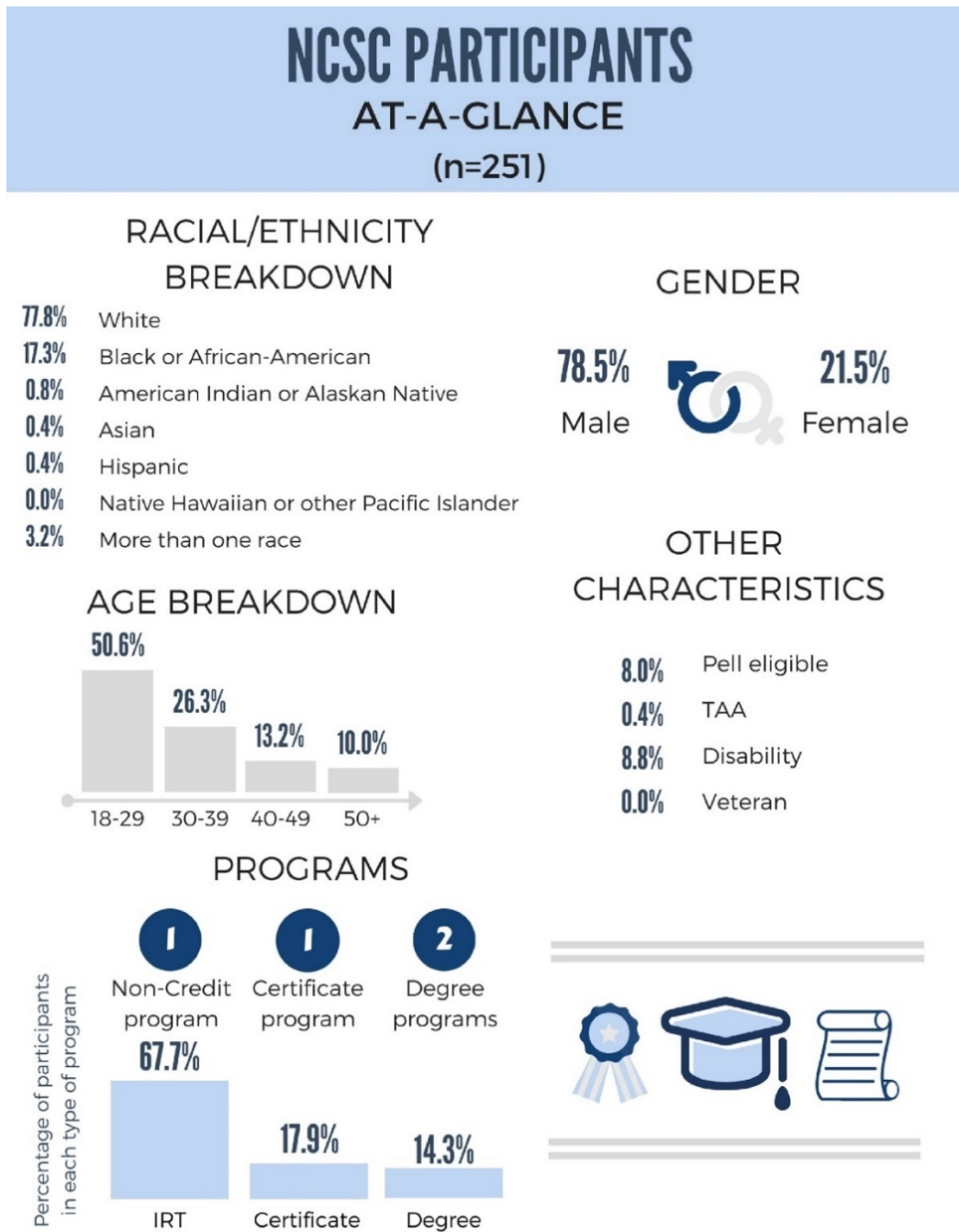


Figure 5-6: Differences Among Students in Non-credit vs. Credit Programs

	Noncredit (n=170)	Credit (n=81)
<b>Gender</b>		
Male	69.3	97.5



	Noncredit (n=170)	Credit (n=81)
<b>Female</b>	<b>30.7</b>	<b>2.5</b>
<b>Age</b>		
<b>18-29</b>	<b>53.5</b>	<b>44.4</b>
<b>30 and older</b>	<b>46.5</b>	<b>55.5</b>
<b>Race</b>		
<b>American Indian or Alaskan Native</b>	<b>1.2</b>	<b>0.0</b>
<b>Asian</b>	<b>0.6</b>	<b>0.0</b>
<b>Black or African American</b>	<b>23.5</b>	<b>3.9</b>
<b>Hispanic</b>	<b>0.0</b>	<b>1.3</b>
<b>White</b>	<b>70.6</b>	<b>93.6</b>
<b>More Than One Race</b>	<b>4.1</b>	<b>1.3</b>
<b>Other characteristics</b>		
<b>Pell recipient</b>	<b>0.0</b>	<b>24.7</b>
<b>Disability present</b>	<b>12.4</b>	<b>1.2</b>

Source: College administrative data

## Student Support and Job Placement

NCSC's career coach provided student support services and job search and placement assistance. In practice, students enrolled in noncredit programs were more likely to receive student support services than students enrolled in credit programs. Although staff members attempted to communicate that the services were available to students enrolled in credit programs, very few came in to receive them. There were two different career coaches in place during the grant period—one during the first year-and-a-half and another during the last two years. The career coach compiled information about local social service resources and focused on providing counseling, information, and referral. Each career coach, in turn, connected students who needed assistance for housing, utilities, food, and transportation with a state grant program called Healthier Buckeye, among other community resources. When asked to identify the top three barriers to completion for students, the career coach replied:

*Transportation, I would say transportation... I think poor self-concept, self-esteem. They get anxiety about, you know, taking tests. For someone who hasn't been in school... it's like a deer in headlights, that's for real.... But to go back to your question, one: transportation, two: poor self-esteem, coping skills, and... [having] the [technical] abilities [is] another big one, the third one.*

The career coaches provided follow-up services to completers beginning one week after graduation, with additional check-ins at 30, 60, and 90 days. When following up with completers, career coaches offered resume advice, interviewing practice using mock interviews, academic and job counseling, and referrals to community resources. In the third year, NCSC began hosting for each IRT cohort an Employer Day, a four-hour session during which local employers made presentations to students describing the types of jobs they offer.

Several students said that they valued that instructors also reached out to them to offer their support:

*They all offer to stay [after class to help out with academics]. I did talk to one [instructor] back here on decimal equivalents real quick one day. I mean, he didn't mind a bit to stay and talk to me. They've actually all pretty much offered: "Hey, if you need anything, just stay."*

— IRT student

While the grant helped create new opportunities for populations with many employment barriers to access entry-level job training programs, some challenges arose because (1) the college did not yet have enough opportunities in place for students to move from noncredit to credit training programs; (2) it was difficult for the college to place students into jobs with only the IRT training completed; and (3) many students struggled to overcome personal, financial, and logistical barriers to employment readiness. Moreover, employers had difficulty trusting in the quality of candidates coming out of the IRT program because so many IRT participants faced such barriers and because some of the new hires did not work out well.

Employers reported in the employer survey and focus groups that they had a difficult time hiring graduates from NCSC due to the high number of candidates who struggled with substance abuse problems:

*With pre-employment drug screen, we lose a lot of people. We lose people during random drug screens. We lose someone every other time. [...] We are understaffed every day.*

— Employer

## *Training Programs and Curriculum Development*

### **Noncredit Programs**

NCSC's IRT program was the first entry-level basic skills and work-readiness program of its kind at the college. NCSC adapted the original IRT curriculum provided through the consortium from STCC. The college offered this iteration of IRT with minor variations through the first two years of the grant term. In the third year, NCSC made some changes to the IRT program:

- The curriculum was aligned with the Manufacturing Skill Standards Council (MSSC) Certified Production Technician (CPT) Safety training component (an industry-recognized credential).
- The Occupational Safety and Health Administration 10-hour training (OSHA 10) component of the IRT could be articulated to two college credits.
- Content on substance abuse education and coping skills was added to address local needs.

In the third year of the grant period, in response to interest from employers on the advisory board, NCSC developed *Introduction to Supervision*, a noncredit course that focused on training incumbent workers in supervisory and management skills. The employers indicated that they wanted this training—and were even willing to help fund it—because they anticipated a large wave of current workers to retire and wanted to promote some of their entry-level staff members into mid-level positions. The first iterations of this training were very short—only eight to twelve hours in duration.

**Figure 5-7: New Noncredit Programs at NCSC**

Program Name	Type of Credential
Industrial Readiness Training	MSSC Certified Production Technician (Safety) OSHA 10 Certificate of Completion
Intro to Supervision	Certificate of Completion

**Figure 5-8: Features of NCSC's IRT Program**

The NCSC IRT program lasted four weeks, including 80 hours of instruction. NCSC offered it in various locations throughout the community to make it accessible to people with barriers to employment.

#### **Curriculum**

OSHA 10  
Soft Skills  
Math  
Measurement  
Blueprint Reading  
Quality Control  
Basic Machine (SMT)  
Interview and Resume preparation  
Substance Abuse Education and Coping Skills  
*(during Year 3 only)*  
Career skills – *year 3 only*

#### **Assessments**

WorkKeys pre- and post-tests  
Assembly Assessment  
Quality/Measuring Assessment  
SMT Assessment  
CPT safety assessment *(during Year 3 only)*

## **Credit Programs**

As described in the institutional context section above, NCSC made changes to the credit programs as part of a larger effort to streamline and reorganize curricula in the new BIT department (which NCSC created by merging the business and engineering schools just before AMMQC began). Thus, it is difficult to determine precisely the extent to which the changes that NCSC made to the credit curricula were driven by AMMQC rather than the internal re-organization effort.

However, during the grant period NCSC made substantial enhancements to the credit program, and AMMQC grant funds supported that effort through funding for additional instructors, curriculum development, and purchase of new equipment. As of the last round of site visits, NCSC respondents said that they were in the process of expanding course curricula further with new content related to production processes, such as lean Six Sigma, quality, and CNC machining. Exhibit 5-9 summarizes how NCSC streamlined its advanced manufacturing programs through the re-organization using AMMQC funds (at least in part).

**Figure 5-9: Changes to the Structure of Credit Programs at NCSC During the Grant Period**

Pre-AMMQC Credit Programs	Post-AMMQC Credit Programs
<b>Associate's Degrees (2-year)</b> <ul style="list-style-type: none"> <li>• Engineering Design Technology</li> <li>• Electrical Engineering Technology</li> <li>• Mechanical Engineering Technology</li> <li>• Electromechanical Engineering Technology</li> <li>• Manufacturing Tool and Die Engineering Technology</li> </ul>	<b>Associate's Degrees (2-year)</b> <ul style="list-style-type: none"> <li>• Manufacturing Technology and Operations Management</li> <li>• Mechanical Engineering Technology</li> <li>• Integrated Engineering Technologies</li> </ul>
<b>Certificate Programs (1-year)</b> <ul style="list-style-type: none"> <li>• Robotics and automation</li> <li>• Electrical maintenance (Levels 1-4)</li> <li>• Computer numerical control</li> </ul>	<b>Certificate Programs (1-year)</b> <ul style="list-style-type: none"> <li>• Advanced manufacturing</li> <li>• Industrial design</li> <li>• CNC operations and programming</li> <li>• Electrical maintenance</li> <li>• Manufacturing tool and die</li> <li>• Operations management</li> <li>• Supervision</li> </ul>

### Online and Technology-Enabled Learning

NCSC houses an Integrated Systems Technology (IST) lab at the Kehoe Center, which also houses the BIT division and classrooms. Prior to the AMMQC grant, the equipment available for credit courses was outdated and consisted of computer workstations, materials labs, electric labs, and hydraulic and pneumatic equipment. NCSC made significant upgrades to the IST lab with AMMQC funds. In fact, respondents involved in curriculum development reported that purchasing more FANUC robots and integrating them into the coursework was the most significant impact of the grant on credit programs. They felt that in this way AMMQC enabled them to offer much more hands-on learning and to get faculty certified in FANUC (a certification for teaching with FANUC robots).

*We moved from 12- to 15-year-old obsolete PLCs, robotics to brand new, modern, what we're seeing in local manufacturer facilities. That's where the biggest change came. The basic ideas on the PLC program and the robotic program haven't changed that much – it's still "if/and" statements, "on/off," "true/false." But [the new equipment] gives the students a more realistic and more up-to-date – "This is what it's going to look like, this is what the interface is going to look like, and how I'm going to interact with it."*

Students enrolled in credit programs appreciated the quality of the instruction and the hands-on learning available in the program:

*Comparing the training I got at Madison Career Center... to North Central State, I would say North Central State has the better training program, because it's more hands-on. Yes, you read the books, and everything, but there's a lot of hands-on, and I'm the hands-on type of person. That's how I learn, and that's why I would say that North Central State has the better program.*

Although students enrolled in credit programs benefitted from these equipment enhancements, the IRT students did not generally have access to the new equipment because the IRT courses were usually offered off-site and very few IRT students transitioned to credit-based programs. Thus, although NCSC

offered the IRT with the goal of enhancing access by nontraditional students, the decision to locate IRT instruction off-site inadvertently made it harder for IRT students to bridge from noncredit to credit programs and have access to the new equipment and the improved hands-on learning it made possible.

In addition, the faculty reported that many of the local employers are small companies that are second- or third-tier suppliers to original equipment manufacturers, so their ability and willingness to invest in automated production systems has been somewhat limited (although it is increasing with time). Grant staff members also reported that many local employers do not understand the value of national industry-recognized credentials, because they are not familiar with using them in their hiring process to assess skills.

The AMMQC grant also made possible the integration of new e-learning modules into the credit-based courses. Instructors reported, for example, that they added an interactive multimedia virtual training system for automated production processes called Amatrol into the technology lab. However, faculty members also indicated that the transition to online learning was controversial at NCSC because many instructors felt that manufacturing processes can be properly taught only through hands-on methods:

*It's kind of a sticky subject with the heavy hands-on. You're on two extremes that we'd like the students to be able to learn globally wherever they are, but the curriculum on the technology side is very hands-on. So, if they don't have their own robot, it's very difficult for them to do that without physically being here.*

— Instructor

### *Career Pathways and Articulation*

Through the streamlining and restructuring of credit programs, NCSC made progress towards making the certifications and degrees more stackable and in improving articulation to four-year degrees. For example, the assistant dean of BIT reported that the new Manufacturing Technology and Operations Management degree is made up of five stackable certificates. He elaborated on the department's thinking about how a student would progress through the program:

*The technical certs, those were built and envisioned that at that point, the student is employable and most likely would seek employment, become familiar with their skillset, become valuable to their company, and as they move from an operator to a line supervisor — area supervisor, would come back then to fill in that next year with business management classes to get them the skillsets to make that leap from doing to leading... They [also] have an opportunity from that point to go on to Franklin University and continue in a business pathway.*

In addition to streamlining the credit programs and making them more stackable, NCSC also aligned the coursework with industry-recognized credentials and improved articulation with four-year degree programs. Before AMMQC, NCSC had several articulation agreements already in place with local high schools and technical schools, as well as an agreement with Miami University of Ohio to articulate credits from the mechanical engineering technology program into an electromechanical program there. By the end of AMMQC, NCSC had created two new articulation agreements with four-year institutions:

- from the integrated engineering technologies program at NCSC to a Miami University of Ohio electromechanical program; and
- from the manufacturing technology and operations management program at NCSC to a Franklin University business management program.

NCSC also aligned the credit programs with industry recognized credentials as shown in Exhibit 5-10. However, grant-funded staff members reported that many local employers were not familiar with the national industry-recognized credentials such as MSSC CPT or FANUC. This suggested a need for better communication with employers to make them aware of the content on which students are tested so that they can make more informed hiring decisions and more fully appreciate the value of credentials.

**Figure 5-10: Industry-recognized Credentials with which NCSC Programs Are Aligned**

Program	Credential(s)
<i>Associate's Degree Programs – 2 years</i>	
Manufacturing Technology and Operations Management (MTOM)	Associates Degree NIMS, OSHA Journeyman certification
Mechanical Engineering Technology (MET)	Associates Degree FANUC Journeyman certification
Integrated Engineering Technologies (IET)	Associates Degree
<i>Certificate Programs – 1 year</i>	
Advanced manufacturing	Certificate of completion NIMS Journeyman certification
Industrial design	Certificate of completion
CNC operations and programming	Certificate of completion NIMS Journeyman certification
Electrical maintenance	Certificate of completion OSHA Journeyman certification
Manufacturing tool and die	Certificate of completion NIMS Journeyman certification
Operations management	Certificate of completion
Supervision	Certificate of completion AMA

Despite NCSC's other achievements, the AMMQC grant did not result in making it easier for students to move from the noncredit IRT program to credit programs in advanced manufacturing. One important step in this direction—a significant achievement—was taken by making the OSHA certification from the IRT program articulate to two college credits. Although we found no evidence that a substantial number of noncredit students successfully made the transition to credit training programs at NCSC during the grant period, awarding credit units for completing noncredit programs represents a promising practice.

There are several plausible explanations for why building connections between noncredit and credit programs was challenging. First, the grant team had decided to offer the IRT program off-site to make it more accessible to populations with multiple employment barriers (many of the individuals they wished to serve did not have transportation to go to the Kehoe Center). Although the decision to off-site IRT provided many individuals with easier access to training, it also limited the extent to which those students could be exposed to the campus environment, equipment, and instructors. Second, because NCSC lost significant revenue with the closure of the GM plant in 2009 (GM had supported training

programs at the college) and was struggling with low enrollment, the administration's priority was to reorganize and update the credit programs so that they were more aligned with employer needs and integrated new technologies.

In addition, three years was probably not a realistic time-frame for NCSC to achieve its strategic goals with academic programs as well as focus on establishing new bridges from noncredit into credit programs. In that sense, the NCSC case illustrates that shifting to a career pathways model takes time.

## Sustainability

The AMMQC grant updated and strengthened advanced manufacturing credit programs at NCSC, allowed the college to experiment with novel program models for serving adult learners, and increased capacity for building partnerships. Moving forward, it was not completely clear how these achievements would impact the college long-term or which elements of AMMQC would persist in the same form or a modified form. NCSC respondents felt that the following components of AMMQC were most likely to be sustained:

- **Institutional knowledge.** Although the career coach, business liaison, and recruiter positions will not be replaced, the regional project manager transitioned to another position at the college (director of a workforce center affiliated with the college) and the key faculty members and administrators involved in curriculum development will stay in those roles to bring what they learned from AMMQC into the future operations and innovations at the college.
- **Employer relationships.** The employer relationships forged during the grant are expected to continue through bi-annual advisory board meetings; however, unless the college decides to commit more permanent resources to employer engagement, there are likely to be limits to the extent that college-employer relationships become more strategic and deeply aligned with employer needs.
- **Partnerships.** NCSC strengthened partnerships and referral processes with two key partners: the publicly funded workforce system and the municipal court system. In this way, the grant will likely lead to better service coordination and other opportunities for meeting local training and employment needs.
- **Introduction to Supervision program.** The incumbent worker training program that NCSC developed in response to employer demand is likely to continue and there is potential for it to become a revenue source for the college if the employer demand remains strong.
- **Equipment in the IST lab.** Robotics, eLearning (Amatrol), and other equipment that NCSC purchased through AMMQC will continue to enhance the credit programs (certificate and degree programs) and provide more up-to-date hands-on learning opportunities for students.
- **Prior Learning Assessment.** NCSC's PLA Accelerator, developed in partnership with CAEL, is likely to get incorporated into the college's general advising structure, which may enable more students with existing skills and experience to move through the college's training programs faster and improve completion rates.

In addition to the components above, NCSC has been able, in part through AMMQC, to initiate new opportunities for regional coordination and pursue new grant funding. For example, NCSC is now part of the Regional Manufacturing Coalition, which will enable the college to maintain its relationships with employers to some extent. The college was also invited to partner in the *Foundations for Manufacturing Careers: Worker Readiness in Ohio* program, which receives partial funding through the Ohio Technical Skills Innovation Network, a TAACCCT Round 4 consortium. The college is also participating in several initiatives including the Lightweight Innovations for Tomorrow (LIFT) Manufacturing Institute, the



Lumina Foundation's Right Signals Initiative, and a state-funded grant from the Robotics Advanced Manufacturing Technology Education Collaborative called the *Straight a Grant*.

As of the last round of site visits, grant staff members did not expect the IRT program to continue because sufficient grant-replacement funding had not been identified. The availability of more intensive student support and career coaching also will not continue after AMMQC, although there are several resources on campus for tutoring and other needs (which were available to all students before the grant).

The regional project manager felt that the most sustainable impact of AMMQC overall was a shift in the institutional mindset of the college toward a view that emphasizes the importance of keeping the training programs aligned with new technologies, responsive to industry needs, and more sensitive to the barriers of nontraditional students. This new mindset, she said, is championed by some of the new people brought in under the grant:

*I think our biggest sustainability, honestly... is not so much in persons but more in theory. We've strengthened the credit programs that're here, which is going to ensure that they will be strong enough and technologically savvy enough to carry on for a while. We have brought some excellent people in, like [former project manager] taking a faculty position, the former TAACCCT faculty member taking the taking assistant dean position. And... I think I've added something to the college, and they're looking at hopefully keeping me on as well. So [NCSC has] gained some good, valuable employees in this. The programming, the relationships, our ability to reach out like to [an employer], where [NCSC] had not had a relationship before.... So, through the grant, we've been able to make relationships, as we talked about earlier, that are going to last past the grant.*

## Conclusion

Although NCSC was operating with some formidable constraints—given the state of the regional economy in central Ohio and several broader institutional and social challenges—it was innovative in its approach to implementing AMMQC and achieved several key grant objectives. Compared to the advanced manufacturing programming that was available before AMMQC, the college has made substantial progress towards a career pathways approach on several fronts.

### Key Accomplishments

Over the three-year grant term for AMMQC, NCSC focused on two fronts: (1) piloting noncredit IRT programs to reach the target populations for the grant (displaced workers, adult learners, older workers, and other nontraditional students with employment barriers); and (2) overhauling credit programs in advanced manufacturing by making them stackable, aligning them with industry-recognized credentials, enhancing their articulation with four-year degrees at other institutions, and providing them with updated training equipment. To achieve those institutional changes, NCSC enhanced partnerships with employers, workforce partners, and community partners. Through these efforts, NCSC brought about several notable accomplishments:

- **piloting and customizing the IRT program** to meet the specific needs of the local community and offering it in locations that made it possible for underserved populations to receive entry-level job training, gain exposure to advanced manufacturing opportunities, and receive wraparound assistance to help them complete training and find employment;
- **updating the advanced manufacturing credit programs** with new equipment, eLearning software, and hands-on learning modules;



- **engaging employers** in curriculum development for both IRT and credit programs to better align the programs with their current needs and to set the stage for future engagement efforts and collaborations in the region;
- **developing an online PLA tool** that the college can use in its admissions and advising processes to help adult learners receive credit for their existing skills and advance more quickly through their programs;
- **creating new curricula in supervisory/leadership training** to help employers meet their needs for preparing individuals in their existing workforce for management positions;
- **providing students with hands-on learning and support** that was received with great appreciation; and
- **enhancing credit articulation** from high schools into the credit programs in advanced manufacturing, from the programs to four-year institutions, and from the OSHA certification component of IRT into college credit.

Grant staff members reported that the most lasting impact of the grant will be on how it began to change the mindset at the institution, especially among the instructors, staff members, and administrators who would stay on after it was over. These individuals now recognize the importance of incorporating employer needs into the curriculum, emphasizing hands-on learning on up-to-date equipment, and incorporating stackable credentials and articulation to four-year institutions into the structure of the new credit programs.

### *Challenges and Lessons Learned*

Despite the many achievements listed above, NCSC also found it challenging to implement all the components of a career pathways system within the three-year tenure of the grant. Most notably, the college continued to operate the noncredit and credit programs separately and did not effectively connect IRT students to opportunities in credit programs. As described previously, the barriers that the college encountered largely had to do with factors that were outside the control of the grant staff—namely the state of the regional economy after two decades of economic decline, challenges with staff retention, and the institutional need to prioritize the restructuring of credit programs and piloting IRT to find a model that worked for the population of the unemployed in the area. From the implementation experience that unfolded as grant staff members worked within these constraints to meet grant objectives, we can derive several key lessons:

- **Full and consistent staffing is crucial to ensuring the success of an ambitious initiative.** Inconsistent staffing and turnover had a negative influence on NCSC's ability to consistently offer all the components in the AMMQC logic model.
- **Social problems in the surrounding community can make it difficult for community colleges to fulfill the objective of providing employers with suitable workers.** Some employers were dissatisfied with many of the job candidates who completed IRT because they suffered from untreated substance abuse problems. This suggests that more resources need to be focused on addressing the heroin epidemic locally and that individuals should be treated before they are referred for training.
- **It can't be assumed that employers will be familiar with industry-recognized credentials.** Grant staff members found that a surprising number of local employers did not know about the credentials recognized in their industries and did not seem to see value in them.
- **Investment in business capacity-building and entrepreneurship can bring dividends other than stimulating innovation and growth.** Companies ready to invest in new technologies are more

likely to be familiar with industry-recognized credentials and to see the value of workers trained on up-to-date equipment.

Moving forward, NCSC appears to be well positioned to continue with its strategy to draw on grant-based initiatives and regional collaborations, having learned more about how to implement and administer a grant-funded program like AMMQC. The college has already joined several other initiatives to continue these systems-building efforts.

## CHAPTER 6: SOUTHWEST TENNESSEE COMMUNITY COLLEGE

Southwest Tennessee Community College (STCC) benefits from the legacies of two colleges, Shelby State Community College and State Technical Institute at Memphis, which merged in 2000 to form STCC. The college operates on two main campuses and four centers in Memphis, with a student body of over 15,000 students,<sup>30</sup> and 200 full-time faculty members.<sup>31</sup> STCC offers 62 programs of study<sup>32</sup> that lead to multiple university transfer and career associate degrees and technical certificates.

The college was moderately successful in achieving most of its AMMQC grant objectives, which included training more than 500 individuals for in-demand occupations, developing stackable certificates within credit programs, and enhancing the college's quality of training through the purchase of instructional equipment. These accomplishments were realized under extremely challenging conditions during the grant period, which included large-scale college-level organizational changes leading to inconsistent institutional support for grant activities, significant turnover among grant staff members, and cumbersome college-level hiring procedures.

This case study describes the economic context for implementation in the STCC region, analyzes how the institutional context shaped implementation, reviews how the college implemented the key components of the grant, and addresses sustainability and overall accomplishments, challenges, and lessons learned.

### Economic Context

STCC's economic region, located at the intersection of three states, comprises 22 counties—six in Tennessee, eight in Mississippi, and eight in Arkansas—and contains nine counties belonging to the Memphis Metropolitan Area. Shelby County, TN, where STCC is located, is at the center of this region.

Exhibit 6-1 below depicts the unemployment rates in all counties of the STCC economic region compared with the average unemployment rate of counties in the nation that placed within one standard deviation of the mean nationwide. The rate of unemployment in the region has been falling consistently in recent years, especially in the counties in which unemployment was the highest during and after the Great Recession. For example, in 2010 unemployment rates were above 10 percent in nearly half of the counties in the region; by 2016, none of the counties in the region had unemployment rates more than 10 percent.

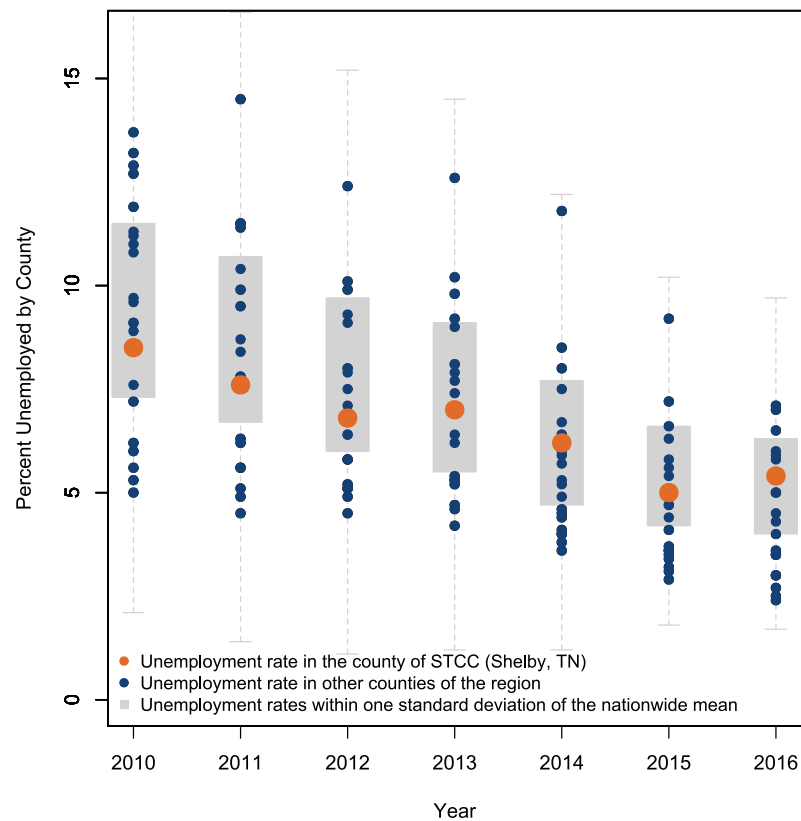
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<sup>30</sup> <http://www.southwest.tn.edu/ir/documents/2016-IPEDS-Data.pdf>.

<sup>31</sup> <http://www.southwest.tn.edu/documents/CommunicationsMarketing/2016-fast-facts.pdf>.

<sup>32</sup> <http://www.southwest.tn.edu/academics/active-programs.htm>.

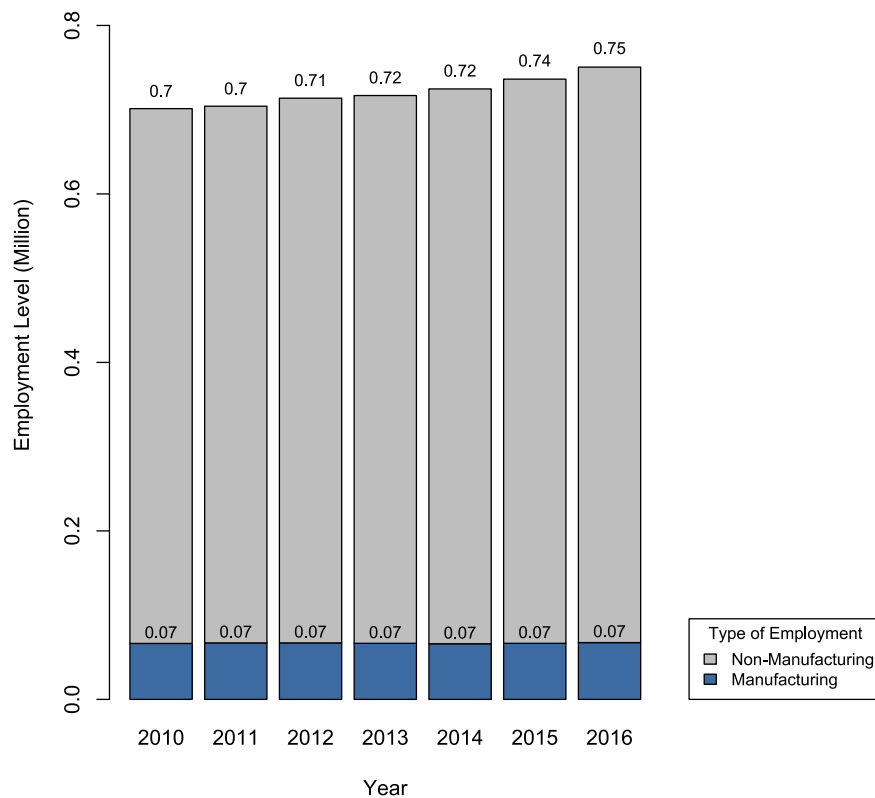
**Exhibit 6-1: Unemployment Rates in Counties of the Southwest Tennessee Community College Economic Region, 2010 – 2016**



Source: Bureau of Labor Statistics, Local Area Unemployment Statistics

The STCC region has a relatively low share of manufacturing employment (around 9 percent in 2016). This rate has been falling slightly since 2010, as shown in Exhibit 6-2 below.

**Exhibit 6-2: Annual Averages of Monthly Employment Levels in the STCC Economic Region, 2010 – 2016**



Source: Bureau of Labor Statistics, Quarterly Census of Employment and Wages

The largest clusters in the region's manufacturing sector are automotive parts manufacturing, medical devices manufacturing, and metalworking technology and machinery manufacturing. The importance of the manufacturing sector varies highly by county, and is highest in the city of Memphis. Of all economic sectors in the region, manufacturing is expected to have the slowest rate of job creation (0.2 percent).<sup>33</sup>

Medical device manufacturers constitute a particularly important presence in the Memphis metropolitan area. An employer representative interviewed for the study explained that this industry cluster has more stringent quality standards than other subsectors. The local medical device employer community formed the Greater Memphis Medical Device Council (GMMDC) at the same time the grant started (2014) to enhance and standardize the curricula that local training institutions delivered to students in advanced manufacturing programs.<sup>34</sup> At STCC, therefore, there was a history of employers in the medical device sector intentionally helping to create (and support) curriculum content.

<sup>33</sup> Tennessee Department of Labor and Workforce Development (2012).

<sup>34</sup> <http://www.gmmdc.org/>.

## Institutional Context

In the summer of 2015, STCC experienced a significant leadership change, which happened to occur in the middle of AMMQC implementation and, therefore, had implications for the implementation process. The president, who had led the college through its entire existence, retired,<sup>35</sup> and a new president was appointed. The new president subsequently replaced almost all the top-level administrators, which had the short-term effect of making most of the previously established administrative processes (such as human resources) work at low capacity while the new leadership came on and set up its own systems. This leadership transition was understandably difficult for the college as a whole. Most of the high-level administrators who would have been available otherwise to approve AMMQC changes or oversee grant implementation were replaced, including the associate vice president of workforce, economic development, and continuing education (where the AMMQC team was housed). In addition, the implementation of new processes and procedures—such as articulation agreements and curriculum approvals—that were intended to be key components of AMMQC were substantially delayed or abandoned.

Nevertheless, the leadership transition did not have wholly negative consequences for the AMMQC initiative. According to grant staff members, little in the way of guidance or support came from the college leadership before the transition. “Prior to the change in leadership,” one staff member commented, “grant coordinators didn’t have support from leadership in terms of direction or how to navigate the internal workings of higher education.”

After the leadership change, additional transition challenges arose because key senior staff members were still acclimating to their new jobs. Several grant staff members said that while key personnel overseeing human resources and finance were being installed, it was often not clear where to obtain fiscal information, such as the amount of funding left under the grant for various purposes (e.g., marketing).

Another institutional factor that influenced grant implementation was the low level of coordination between the workforce division (mostly operating noncredit programs) and the rest of the college. According to one of our respondents, the workforce division was originally “set up as a silo,” rather than as a platform that would engage and bring together students, employers, public workforce systems, and faculty from across all college departments. This respondent added that with the new leadership having time to settle in, the college was now “on a better track” and leaders were thinking in a more “holistic way encouraging more collaboration.” Unfortunately, this change occurred too late in the implementation of the grant to allow meaningful change.

Still another institutional challenge associated with the implementation of the AMMQC grant was paradoxically a result of STCC’s success in attracting TAACCCT grant funding. For a considerable period, the college administered four TAACCCT-funded projects simultaneously.<sup>36</sup> Managing so many grant-funded projects at the same time was a daunting task, especially since all four grant-funded projects were staffed by largely the same project administrative team due to the restrictions on hiring mentioned in the next section.

Despite these substantial institutional challenges, which were largely outside the control of the AMMQC grant team, the team made achievements in a few key areas. It did this, in part, with substantial support

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<sup>35</sup> <https://www.bizjournals.com/memphis/news/2014/08/19/southwest-president-announces-retirement.html>.

<sup>36</sup> <http://www.southwest.tn.edu/grants/docs/program-summaries.pdf>.

from other consortium members. MWCC's consortium leadership and STCC grant staff members worked together to find solutions, and they agreed to hire MWCC's industry consultant, a business executive with decades of management experience, to serve as a management consultant to STCC's grant team. The consultant assisted the team by helping re-establish the regional advisory board meetings, increasing recruitment and focusing it on noncredit programs, and making sustainability plans.

Given the level of organizational changes that STCC underwent during the grant period, it is difficult to say for certain where the grant team fit into the college's larger institutional structure because the location appears to have shifted over time. The AMMQC grant was initially housed in the college's workforce development division, called Corporate Training & Continuing Education. By the end of the grant period, however, AMMQC grant staff members reported to the director of Externally Funded Programs–Workforce Development, a new unit that seems to have been created by combining the function of a typical workforce development division with a mission to oversee externally-funded projects. Exhibit 6-3 below represents our best estimate of how to represent grant staff members' place within the college's institutional structure. The exhibit makes it apparent that the grant team was situated several layers removed from the college's top leadership position (president).

**Exhibit 6-3: STCC AMMQC Grant Organizational Chart**



## Grant Implementation

### Partnerships

At the beginning of the grant period, STCC identified the medical device industry as the main industry partner for its credit programs. This selection appears appropriate since, as described earlier in the chapter, medical device manufacturers have a large share of the local manufacturing employment. Because the Greater Memphis Medical Device Council (GMMDC) was an important player in the local business environment, the college nominated GMMDC as its advisory group. Because GMMDC had its own agenda, however, the college had limited opportunities to communicate with its industry partners through the group. (The college had to wait for scheduled GMMDC meetings and had to ask to be given time on the agenda of the association's meeting).

Based on feedback from SPR and the AMMQC industry consultant, STCC subsequently changed this approach. In late 2016, STCC successfully recruited local employers to serve on a new advisory board that comprised companies from various manufacturing subsectors. The industry consultant helped assemble the advisory board based on his previous knowledge of the business sector. During the advisory board meetings, members reviewed curriculum, discussed necessary updates to equipment and discussed local employers' needs. While employers had mixed reviews of the advisory board, one employer stated that it was receptive to feedback and its members had a desire to meet local manufactures' needs:

*I liked reviewing curriculum, and providing information about what content is obsolete or needs to be changed, how to set up manufacturing and technical equipment. The advisory board listens [...] to the employers' need and the differences between what colleges put out [employees] versus what manufactures need and took the feedback to hear. They have a desire to meet local manufactures needs, especially in the medical device industry.*

Initially, STCC had a strong partnership with a local American Job Center (AJC)—a part of the state's Workforce Investment Network (WIN)—through which the local AJC referred individuals to the Industrial Readiness Training (IRT) program and paid the cost of attending the program. This partnership was driven in large part by interest from a local employer, Electrolux, and its need to hire hundreds of workers in a relatively short amount of time as the company established a plant in the Memphis area.<sup>37</sup> For the AJC, this partnership was attractive because job placements at Electrolux would boost its performance measures in terms of employment and retention. By the middle of the grant period, however, Electrolux' hiring needs became substantially less pressing, and the partnership between the AJC and the college grant team began to deteriorate. This suggests that there are risks to concentrating employer engagement efforts on the needs of one employer, which can easily change in a short period of time.

### Staffing

Turnover within the grant team presented significant challenges to implementation. One reason for the staff turnover was the transition in institutional leadership mentioned above. Respondents mentioned also that staff members were often motivated to leave their jobs because of the opportunity to obtain higher wages by taking a job in industry. Taken together, these two factors resulted in significant turnover:

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<sup>37</sup> MS News Now (2012); Hsu (2013).



- The college replaced its director of workforce development, who had designed and directed the IRT program before the grant.
- The AMMQC regional project manager position turned over twice during the grant period, and when a third regional project manager was hired with only about seven months left in the grant's operations period, she had little time to get established in the new position.
- Three career coaches departed in quick succession during the first two years of grant implementation and the position remained vacant from October 2015 until the end of the operational period.
- A guidance counselor departed in 2015 and was never replaced.

Hiring new staff members under the grant generally took a very long time, and this negatively affected program development. For example, curriculum development for AMMQC was severely delayed because it took nearly two years for STCC to find a full-time credit instructor who was willing to take the job. Although the instructor was finally hired in the summer of 2016, administrative procedures related to hiring caused an additional four-month delay:

*I volunteered to be a full-time instructor in April of 2016 and it took them four months to complete the hiring process. I was hired four days before the start of the Fall 2016 semester and was basically thrown in the deep end and good luck.*

Toward the end of the grant period, much of the remaining workload was left to the new regional project manager, faculty instructors, an IRT director, and a data administrator (who also was working on the other three TAACCCT grants). All these individuals felt overwhelmed by the amount of work they had to do in a short period of time. STCC hired a new director of externally funded programs—workforce development in early 2017 who brought extensive experience in workforce development, but it was too late in the AMMQC grant for him to make any substantial changes (the AMMQC grant period ended at the end of March 2017).

### **Recruitment and Intake**

Recruitment and intake processes for students enrolling in noncredit programs were separate from those for students enrolling in credit programs. In the beginning of the grant period, recruitment activities at STCC mainly focused on attracting prospective students for the noncredit IRT program. As described above, STCC had a partnership with an AJC and Electrolux through which it recruited IRT participants. However, after Electrolux withdrew from this partnership, the partnership with the AJC weakened and the college had a difficult time recruiting participants for IRT. The college's workforce development specialist (who oversaw recruitment for IRT during the last year of the grant period) indicated that enrollment had fallen significantly during this period.

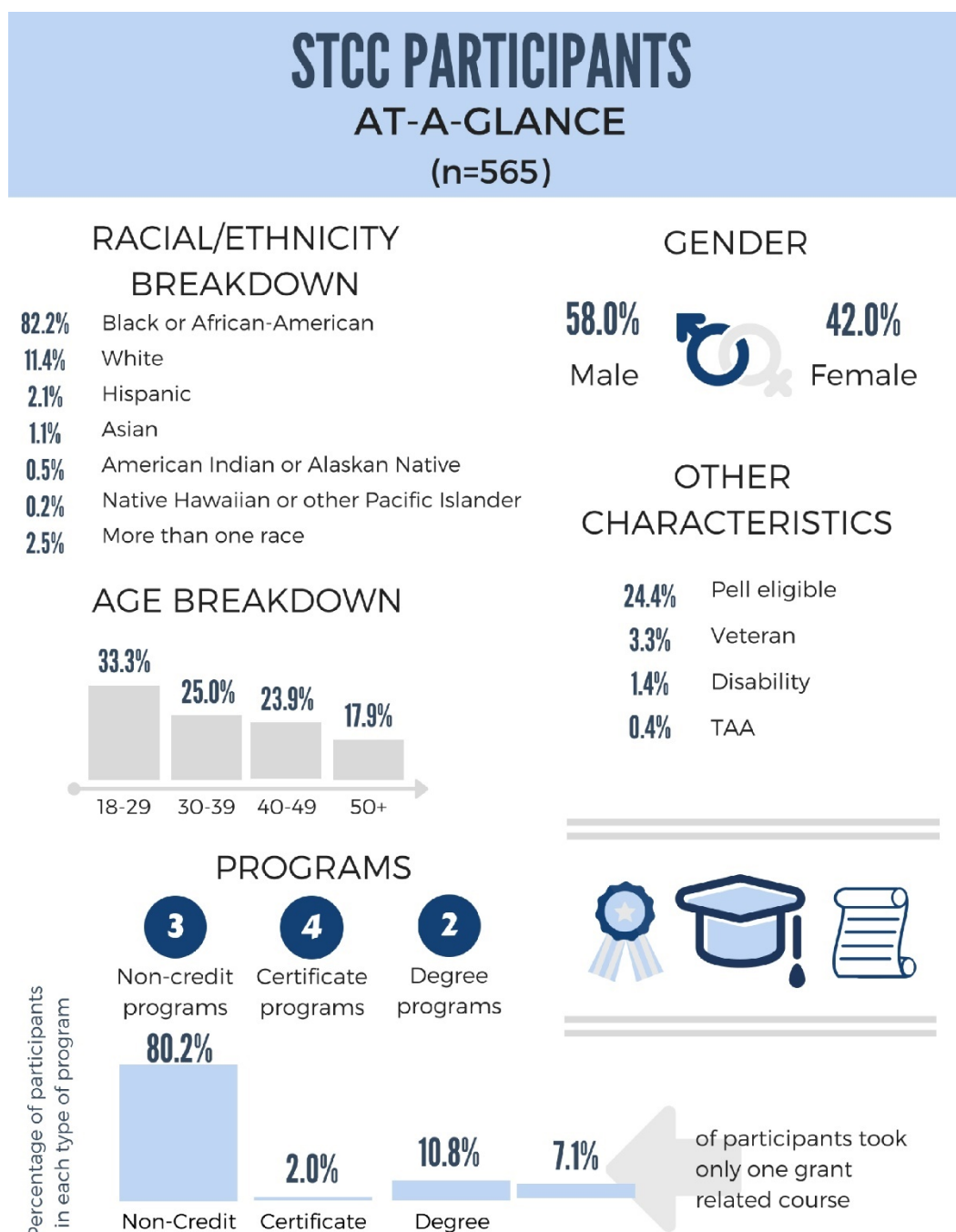
Recruitment of students for the credit programs began later in the grant period, and was limited by the significant grant staff vacancies that occurred by mid-2015. Given this context, recruitment for credit programs—initially delayed by the departure of a credit instructor—declined further. Ultimately, recruitment of students for the credit programs was limited to general college recruitment events, such as the adult education open houses held for all departments.

During the last year of the grant, it became clear that STCC's enrollment levels across both the credit and noncredit grant-funded programs were well below the targets that had been set for AMMQC. In response, STCC consulted with other consortium members, and the industry consultant from MWCC came to STCC to conduct a review of program implementation. He recommended that the grant team create a series of short-term noncredit courses to boost enrollment in the final six months of the grant as much as possible. The team re-launched its recruitment efforts, making presentations at local

churches and schools to promote the new programs and increase awareness of advanced manufacturing. The new noncredit programs were also advertised on the Memphis Public Library website and on social media.

Ultimately, STCC reached its overall enrollment goal of 560 participants recruited for the AMMQC programs. Exhibit 6-4 shows the demographic characteristics of the students enrolled in AMMQC programs at STCC. Of the 565 individuals enrolled, a large majority were noncredit program participants. Many of the participants were male and most were African-American and above 30 years of age.

**Exhibit 6-4: Characteristics of STCC Participants in AMMQC**



## Student Support Services

As discussed in the previous section, program activities revolved primarily around IRT during the beginning of the grant period. Continuing a pattern already started before AMMQC, the local AJC referred prospective participants to the college and AJC staff members offered students enrolled in the WIOA federally funded workforce programs not only tuition payments, but also case management, supportive services, and job placement services. Because of this arrangement, and because most IRT participants were WIOA clients, the college's grant team relied on career coaches based at the AJC to provide IRT students with these services. The expectation was that as credit programs were developed and filled with participants who were not clients of the AJC, the grant team would begin drawing on its internal capacity to provide student support services.

In addition to the services provided by the local AJC, grant participants (both credit and noncredit) could also rely on student services available on campus. During SPR's first annual site visit, STCC's dean of instruction explained that the college had a student support center, offered bus passes, and provided childcare on two of its major campuses. The dean also stated that an online early warning system existed that allowed instructors to suggest an intervention if they suspected a student had urgent needs or was confronting a crisis. Referrals to outside organizations or services were also used for issues that the college staff members were not well-equipped to address, such as homelessness.

While the college provided financial assistance in the form of gas cards or child care assistance, several students expressed concerns about the financial burden of paying for their education:

*There [were] people...in my class that [have] financial struggles that made sacrifices. I often thought... "Wow, it would really be good if this program could give some type of stipend.*

*My biggest issue is trying to sponsor these classes. As of right now it's difficult for me to pay for some of my classes out of pocket.*

One student stated that while the gas card provided by the college helped her, she was not always able to go pick up her gas card, because she needed to use the time between classes and her job to prepare meals for her children.

The credit programs enhanced with AMMQC funding were substantially delayed for reasons discussed earlier, and by the time some credit students did enroll in AMMQC, the grant team was suffering from significant staffing shortages. This meant that the supports intended under AMMQC—having career coaches, job developers, and intake specialists available to help students overcome barriers and receive assistance with job search and placement—were not fully implemented. Because of the timing of these challenges, most grant participants enrolled after mid-2015 received few support services outside of what the college could typically provide to its students and what those who were eligible received from programs such as WIOA.

Career Services (a college department not affiliated with the grant) began providing employment support for IRT students in late 2015 and for both credit and noncredit AMMQC participants in fall 2016. These were services available to all students at the college, not just AMMQC participants, but the grant team arranged for the Career Services office to devote more resources and staff time to AMMQC participants through a subcontract. According to STCC's Career Services director, the department consisted of her, two career specialists, and a support staff member. These staff members provided job search and placement assistance in the form of career assessments, resume review, interview

preparation, organization of career fairs, provision of online job listings, and access to an online career coaching software program.

However, the available data indicate that some grant participants may not have been aware of the employment services available to them through the college. A student who participated in a focus group held during the third annual evaluation site visit (December 2016) described a perceived lack of job placement services near the end of the grant period:

*We never came into any contact with any [employers]. [...] it would be very nice for somebody to come and visit and tell us basically what the job expects.*

### **Curriculum Development: Noncredit Programs**

The grant team at STCC initially focused on providing training for participants enrolled in IRT, which was originally envisioned as the only noncredit program that the college would develop under AMMQC. In late 2016, however, following recommendations from AMMQC's industry consultant, STCC created two additional noncredit programs, both centered on lean manufacturing and quality control. Exhibit 6-5 summarizes the noncredit programs that were developed for the AMMQC grant.

**Exhibit 6-5: STCC Noncredit Programs Developed under the AMMQC Grant**

Program Name	Type of Credential	New or Enhanced
ISO Training	Certificate of completion	New
Lean Six Sigma Yellow Belt Training	Certificate of completion	New
IRT	Certificate of completion	Enhanced

**IRT.** Industrial Readiness Training (IRT) was created before the AMMQC grant. Under the grant, the team enhanced the IRT with additional modules and new lab equipment. IRT was a four-week, in-person training program that provided 49 hours of instruction and awarded a noncredit certificate that could be transferring into 4 units of academic credit if a student first earned specified credits.

**ISO Training.** The ISO training provided participants with an understanding of the process improvement skills used in the advanced manufacturing, process control, transportation, and logistics fields. The program was offered as a two-day course beginning in the Spring of 2017.

**Lean Six Sigma Yellow Belt.** The Lean Six Sigma Yellow Belt training provided participants with an understanding of the process improvement skills used in the advanced manufacturing, process control, transportation, and logistics fields. It was a new noncredit course developed under the grant and offered for a short period of time at the end of the grant in late 2016 and early 2017. The course was available in two formats: one two-day option and another three-day evening course. The grant staff implemented the flexible scheduling option in response to requests for evening courses for nontraditional students.

## Curriculum Development: Credit Programs

As noted earlier, the institutional changes stemming from the presidential transition and difficulties in recruiting, hiring, and retaining faculty severely limited STCC's ability to implement the planned curriculum changes to credit programs as part of AMMQC. A full-time credit instructor agreed to take the job in April 2016 and began working four months later (due to a lengthy hiring process), but because curriculum development takes time and new credit courses must go through several levels of administrative review, the instructor was faced with a very difficult task.

By the end, the team created two new certificate programs under the grant—Machining Fundamentals Technical Certificate and Advanced Machining Technical Certificate. These yearlong programs led to stackable certificates and students could enroll in both without having to take the general education requirements that are usually required to obtain an associate's degree.

Information made available to SPR researchers shows that, in addition to these two new certificate programs being created, several existing programs were enhanced by the purchase of new equipment (see Exhibit 6-6 below):

**Exhibit 6-6: STCC Credit Programs Developed or Enhanced under the AMMQC Grant**

Program Name	Type of Credential	New or Enhanced	No. of Credits
Machining Fundamentals Technical Certificate	Certificate of completion	New	18
Advanced Machining Technical Certificate	Certificate of completion	New	19
Mechanical/Manufacturing CAD Technical Certificate	Certificate of completion	Enhanced	20
Quality Assurance Technical Certificate	Certificate of completion	Enhanced	18
Mechanical Engineering Technology - Manufacturing Concentration	Associates Degree	Enhanced	64
Mechanical Engineering Technology - Mechanical Design Concentration	Associates Degree	Enhanced	64

Most of the credit programs created or enhanced through the grant are stackable (that is, they can be taken sequentially or simultaneously to acquire credit toward a higher academic credential). For example, the completers of the machining fundamentals certificate could continue by enrolling in the advanced machining certificate program. In addition, completers of the CAD and quality assurance certificates were encouraged to enroll in the mechanical engineering degrees enhanced through the grant.

The original AMMQC grant proposal stated that STCC's certificate programs would be aligned with NIMS standards (i.e., adequately preparing students to take the NIMS test). This objective was achieved during the grant for the two machining certificates (which are aligned with NIMS machining standards). A

barrier that grant participants mentioned was that there was a fee associated with taking the NIMS exam. Some of the students interviewed in the focus groups said that they wished the program covered the NIMS certification fee because many local employers require the certificate. However, rules set by USDOL prevent TAACCCT grantees from using grant funds for this purpose.

### *Articulation and Career Pathways*

As noted above, although most of the credit programs offered through the grant were stackable, the articulation from noncredit to credit programs did not materialize as intended in the original grant proposal. The noncredit IRT program was conceived in part as an entry point into the career pathways made up of credit programs, but without credit articulation policies in place, it could not function this way. In addition, it was unclear whether the grant team had succeeded in establishing articulation agreements with other institutions to make it possible for students to transfer and receive credit for academic work completed under the grant.

There were two main reasons behind this gap in realization of articulation objectives at STCC. First, the staffing shortages experienced during the grant severely delayed the implementation of credit programs. Consequently, there was insufficient time at the end of the grant to establish bridges and articulation agreements. Second, the development of articulation arrangements (both internal to the college and with other higher education institutions) requires a high level of coordination and buy-in from multiple levels and divisions of administration and these were lacking during most of the grant period due to the leadership transition.

### *Online and Technology-Enabled Learning*

STCC did not develop online courses under the grant. However, the instructional materials used for some of the grant-funded courses can be accessed online. For example, the CAD courses use AutoDESK products and the 3D modeling courses use Inventor. Both these software packages were free for students, and instructors encouraged students to download and use the software at home for assignments. However, the credit instructor believed that relatively few students benefitted from this opportunity because of their busy academic and life schedules.





STCC made significant upgrades to the equipment used for training in credit courses. Most of the equipment was purchased during the first year, but much of it was not installed until the second year of the grant due to barriers posed by the college infrastructure (a wall in a classroom had to be removed). Students appreciated the opportunity to train using the new equipment, although there were some initial difficulties when it was first installed, as described during a student focus group:

*I took the first machining class this last summer semester and they had just gotten all of that new equipment, which is very nice stuff. None of it worked yet, so it kind of sucks that way because we just looked at the stuff and maybe one of the six lathes was sort of working, not really, but I can understand that because they're all changing it all out and there's a lot to it.*

### Equipment Purchased through AMMQC

- Two 5-axis HAAS CNC Machines
- Three new 3-axis Denford CNC machines
- Ten new HAAS CNC Simulators
- Licenses for ToolingU software

## Sustainability

The most sustainable components of AMMQC at STCC were the credit programs that were enhanced as part of the grant (including the sequencing of stackable certificates), the equipment that was purchased, and the alignment of programs to existing industry-recognized certificates. Because the new credit programs that were developed through AMMQC were still in their infancy at the end of the grant period, it was difficult to assess how sustainable they will ultimately be (most colleges will discontinue programs that fail to reach a minimum level of enrollment).

The sustainability prospects of the noncredit programs developed through the grant appeared mixed, and hinged on the likelihood of obtaining additional funding, either from employers or from additional grants.

There were promising signs that the college was moving toward creating a long-term strategic vision that involves leveraging resources from multiple grants and strengthening ongoing partnerships with employers and regional workforce intermediaries. Near the end of the grant period, the creation of a division of externally funded programs and workforce development represented a sign that the college sought to be more strategic and organized about how it administered grants. In addition, the creation of a new manufacturing advisory board independent of any particular grant was a promising practice in that it may enable the board's persistence.

It is also promising that the college has been awarded subsequent grants that will continue the work started with AMMQC. Notably, STCC became a member of a public-private consortium led by the Greater Memphis Alliance for a Competitive Workforce (GMAC) that was awarded a \$6 million award from USDOL as part of the America's Promise grant program. The project will involve a strategic partnership of manufacturing employers, training providers, and workforce agencies that will provide education, training, support services, and job placement assistance in the regional medical device manufacturing sector. STCC is one of several training providers that will provide advanced manufacturing training and student support to low-income and under-represented individuals under the grant.

## Conclusion

AMMQC has had important impacts on STCC at the systems level, even though casual examination of the evidence would indicate otherwise. Most significantly, the experience with AMMQC has pushed the college toward operating grant-funded programs in a more strategic manner and altered its approach to employer engagement. STCC also learned lessons from its program development efforts, its purchases of instructional equipment, and its development of employer and workforce partnerships. What the college did achieve under the grant was accomplished under extremely challenging conditions:

- The college is in a region where manufacturing has not been traditionally strong.



- Massive organizational changes occurred at the college during the grant period, resulting in inconsistent institutional support for grant activities.
- The college struggled to effectively administer four overlapping TAACCCT-funded projects (including AMMQC) at the same time.
- Significant staff turnover led to weakened employer and industry partnerships.
- Overly complicated college-level hiring procedures contributed to staffing shortages that significantly delayed implementation of key project components.

### *Key Accomplishments*

The college was moderately successful in realizing most of its key grant objectives:

- **More than 500 individuals were trained in relevant, in-demand manufacturing occupations.**
- **Stackable credit programs were developed that are aligned with industry standards.** Short certificate programs can lead to completion of two-year degrees; all programs are aligned to NIMS standards; new equipment is used in instruction.

In addition, AMMQC successes were leveraged to secure additional grants. STCC is one of the members of a consortium that was awarded an America's Promise grant from USDOL, which will allow STCC to continue to build and sustain its advanced manufacturing program.

### *Challenges and Lessons Learned*

As stated above, STCC's moderate accomplishments should be viewed and interpreted from the perspective of the adverse conditions under which the grant team operated. Confronted with dramatic challenges, the grant team showed strength and resilience by adapting its strategies. From this experience, it is possible to derive some potential lessons:

- **College organizational structures that facilitate the leveraging and braiding of multiple sources of funding have the potential to mitigate implementation challenges such as staffing shortages.** During the last year of the grant, a new college division was created by combining the function of a typical workforce development division with a mission to oversee all externally-funded projects. The new division could more easily leverage and braid multiple sources of funding, which might have helped alleviate some of the AMMQC implementation challenges had it been created sooner.
- **Industry advisory boards cannot fulfill their functions effectively unless they are convened by the college.** While the grant team correctly identified the medical device industry as an important stakeholder for AMMQC, its nomination of an industry association as the project's advisory board turned out to be a misstep because the college's lack of control over the association's activities hampered efforts to engage the industry. Subsequently, the grant team appointed an independent advisory board that was common across several grants and was more likely to provide the desired employer input into the development of college programs.
- **To prevent grant implementation from being negatively impacted by the withdrawal of one stakeholder, it is important to engage several important stakeholders.** Initially, STCC had a strong partnership with a local AJC and the company Electrolux under which noncredit program participants were recruited. But this arrangement dissolved once the company's need to hire workers disappeared. Grant team members realized that the initial employer engagement strategy had been too invested in the success of one key partner.



## CHAPTER 7: AMMQC OUTCOMES

Following the project’s logic model described in Chapter 1, this chapter describes and analyzes the outputs and outcomes of the AMMQC consortium at the college level, individual student level, and employer level. The chapter draws on several data sources: college administrative data; a survey of program completers; student focus groups; a survey of employers who were involved in AMMQC activities; and focus groups with employers.

### College-Level Outcomes

TAACCCT-funded initiatives were primarily aimed at expanding the consortium colleges’ capacity to provide training with a view of correcting labor market imbalances, as explained in Chapter 1. Toward this goal, the consortium created or enhanced eight noncredit and 16 certificate and degree programs (see Exhibit 7-1 below). Of the 24 programs developed or enhanced through the grant, colleges developed new curricular content for nearly half, and all colleges developed at least one new program. The remaining programs were enhanced in a variety of ways, such as by adding new instructional technology, deploying simulation software, and adding new courses or modules to existing curricula.

**Figure 7-1: New or Enhanced Programs at AMMQC Consortium Colleges**

	Noncredit		Certificate		Degree	
	New	Enhanced	New	Enhanced	New	Enhanced
BPPC	0	1	2	0	1	0
MWCC	2	1	2	0	0	2
NCSC*	1	0	0	1	0	2
STCC	2	1	2	2	0	2
<b>Consortium</b>	<b>5</b>	<b>3</b>	<b>6</b>	<b>3</b>	<b>1</b>	<b>6</b>

\*As mentioned in Chapter 5, NCSC went through a reorganization of its credit programs. For this reason, the count of degree courses that were ultimately enhanced with grant funds is a conservative estimate.

Source: Implementation Study.

Exhibit 7-2 shows that the consortium exceeded its target goals in terms of the number of unique participants enrolled and the number of participants who completed credentials during the evaluation period.<sup>38</sup>

<sup>38</sup> Table 7-2 does not include the completion rates for 129 students who were still enrolled in their programs by the time the grant period ended or additional students who successfully enroll in an IRT program from one of the

**Figure 7-2: Targeted and Actual Consortium Outcomes**

Outcome	Grant Target	Achieved	Percentage of Target
Participants Enrolled	1,720	1,745	101
Participants Earning a Credential	1,054	1,286	122

Source: March 2017 college administrative data and grant targets listed in the AMMQC Consortium Final Program Status Report (June 2017).

As presented in the case studies (Chapters 3–6), AMMQC also led to significant increases in the capacity of colleges to serve students, such as new instructional equipment, new connections with employers, and virtual training software.

## Individual-Level Outcomes

We begin this section with an overview of selected sociodemographic characteristics of enrolled participants. We then examine available data on the satisfaction of program completers with the services they received, and continue with an analysis of the students' academic outcomes in terms of completion and retention. Because data on participants' employment and earnings were only available for one of the four AMMQC colleges, these outcomes cannot be reported at the aggregate level.<sup>39</sup>

### *Participant Enrollment and their Demographic Profile*

During the grant period, 1,745 students enrolled in noncredit and credit programs that were created and enhanced with grant funds, and in single grant-funded courses.<sup>40</sup> Exhibit 7-3 contains a breakdown of AMMQC program participants by demographic characteristics. Nearly half (47.5 percent) were black or African-American and slightly more than four in 10 (43.2 percent) were white. The remaining 10 percent were of other racial/ethnic backgrounds. Less than one-third of the participants were women. They also tended to be young, with about four in ten (38.7 percent) in the youngest age bracket (18–29) and nearly one quarter (23.1 percent) in the 30–39 age bracket. About one-fifth of the participants (19 percent) were eligible for Pell Grants, and small percentages of participants were veterans (6.8 percent), students with disabilities (3.5 percent), or TAA-eligible (2.9 percent).

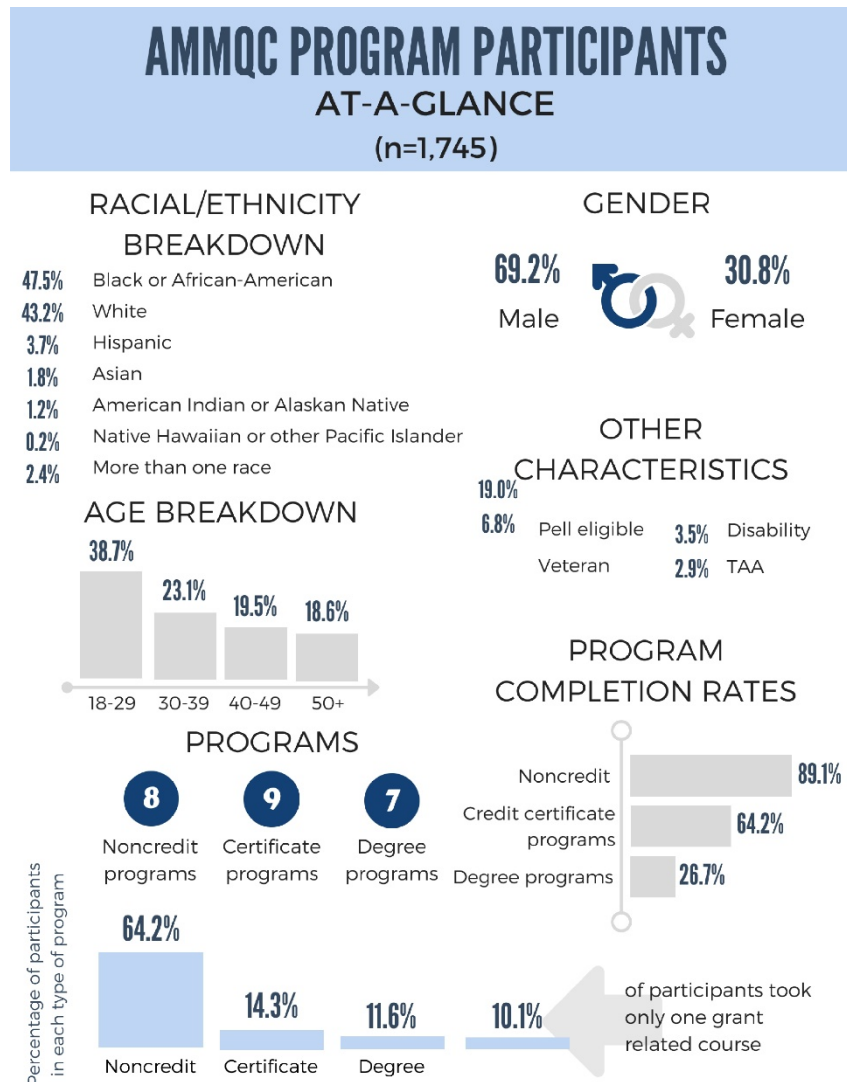
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colleges. Once these students complete their programs, it is likely that the total number of completers earning credentials will increase.

<sup>39</sup> With SPR's assistance, the AMMQC colleges attempted to obtain earnings data on program participants from their state Unemployment Insurance agencies. Despite assiduous attempts, only NCSC succeeded in securing these data.

<sup>40</sup> This number is based on data extracts that SPR received from AMMQC colleges in March 2017. Because subsequent changes and reanalysis that typically occur in a grant program, these numbers may not be identical to the ones that will be included in AMMQC's final Annual Performance Report to USDOL.

Figure 7-3: AMMQC Participant Profile



Note: Percentages of participants in non-credit, certificate, degree programs and only one grant related course equal over 100% because some participants were enrolled in both credit and non-credit programs

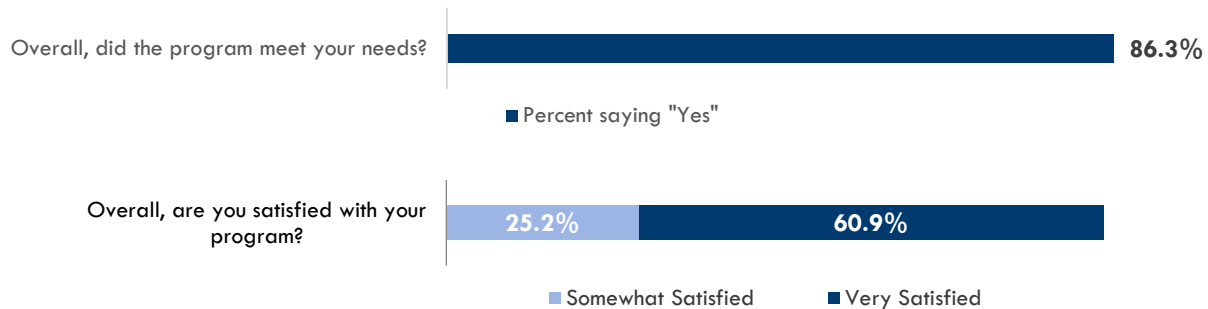
Source: March 2017 college administrative data.

More than half of participants (64.2 percent) enrolled in noncredit programs, about one quarter enrolled in certificate or degree programs (25.9 percent combined), and 10.1 percent of students participated in one or more single grant funded course. The participants who took only one grant-funded course were credit students already at the college pursuing other credit programs who took an AMMQC grant-funded course as an elective, earning credits that counted towards their own degrees.

## Services Received by Completers and Satisfaction with Them

As part of the evaluation activities, SPR conducted a survey of participants who completed AMMQC grant-funded programs.<sup>41</sup> Among several topics, the survey asked about completers' opinions of whether their programs had met their needs and whether they were satisfied overall. Exhibit 7-4 shows that participants who had completed their programs expressed high levels of overall satisfaction—86 percent said their programs met their needs and that they were either very or somewhat satisfied overall.

**Figure 7-4: Completers' Opinions of Overall Program**

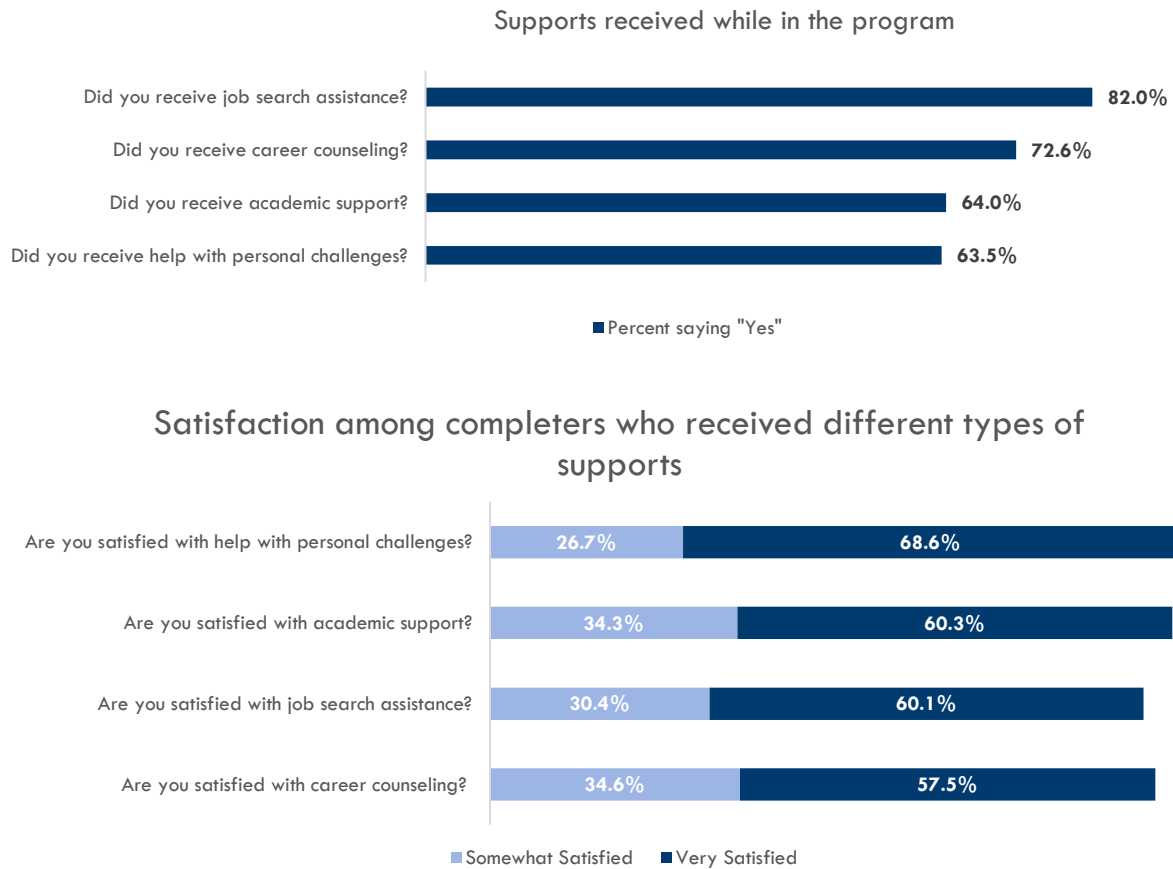


Source: AMMQC Completer Survey.

Survey respondents indicated they received a variety of staff-assisted services while enrolled in AMMQC-funded programs. As shown in Exhibit 7-5, when asked about the different types of services they received, about eight in 10 completers (82 percent) said they received assistance with job searches, nearly three-quarters (72.6 percent) said they received career counseling services, and slightly over six in 10 said they received academic support or help with personal challenges (64 and 63.5 percent, respectively). Completers who received services—regardless of the type—expressed high levels of satisfaction with them. In all cases, at least 50 percent said they were very satisfied.

<sup>41</sup> A total of 333 completers were surveyed between December 2015 and April 2017. Because many survey questions referred to academic programs that were created or enhanced with TAACCCT funds, participants who took only one grant-related course were not included in the survey. See Appendix C for complete information about the completer survey methodology.

**Figure 7-5: Supports Received by Completers and Satisfaction with Supports**



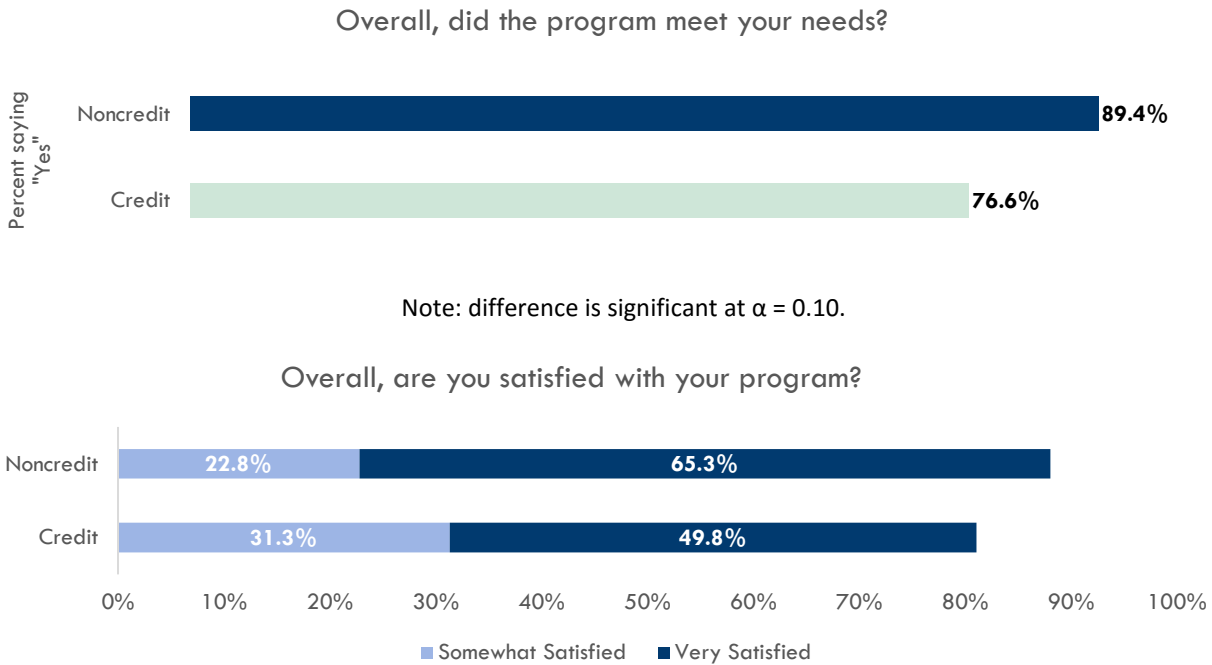
Source: AMMQC Completer Survey.

The high level of satisfaction reported in the completer survey is consistent with findings from qualitative focus groups with students who were still enrolled in a program. Participants regularly praised the grant staff available through the program. Whether a student matriculated from high school or was an individual with decades of work experience, we heard resounding appreciation for services such as academic and financial counseling as well as assistance with resume development, practice interviews, and career coaching.<sup>42</sup>

Because, as shown in the case studies (Chapters 3–6), noncredit and credit programs were substantially different from each other, we examined differences in opinions between those who completed either type of program. Exhibit 7-6 below shows that a significantly higher percentage of completers of noncredit programs said that their needs were met. There were also differences in overall program satisfaction; however, these differences were not statistically significant.

<sup>42</sup> Additional details are offered in Appendix A, Student Perspectives.

**Figure 7-6: Satisfaction by Type of Program**



Source: AMMQC Completer Survey.

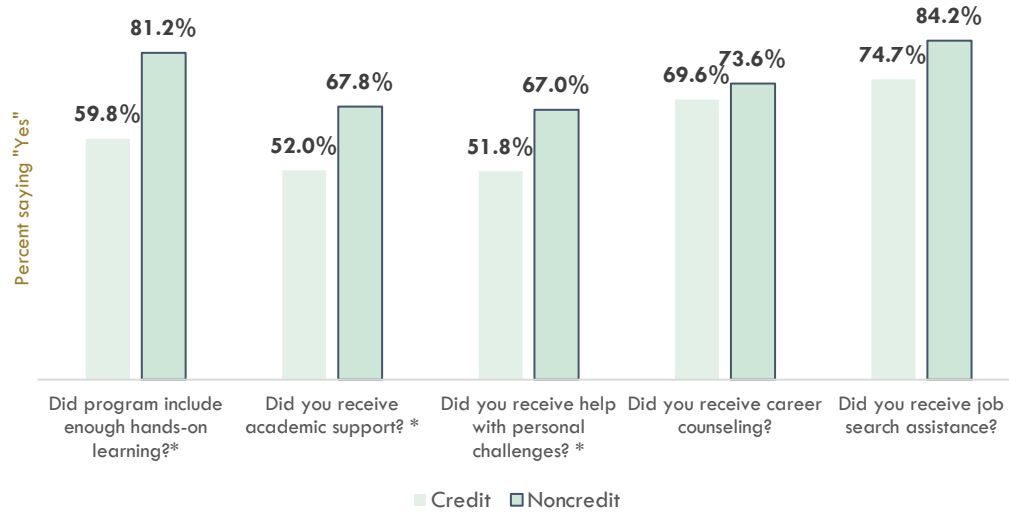
Exhibit 7-7 presents the proportion of survey respondents who received services by type of program. A significantly higher percentage of noncredit program completers said their training included enough hands-on learning (81.2 percent, versus 59.8 percent of those in credit programs). In addition, a significantly higher percentage of noncredit program completers said that while they were enrolled they received academic support (67.8 percent versus 52 percent) and help with personal challenges (67 percent versus 51.8 percent).

These results confirm findings from the implementation study, which generally found that noncredit program participants received more extensive staff assistance than credit program participants did. However, the higher level of hands-on learning reported by noncredit program completers appears difficult to square with qualitative findings presented in the case studies, which suggest that noncredit program participants tended to have less access to equipment than credit participants did. A possible explanation is that noncredit participants might have had lower expectations for the hands-on learning they were to receive.

Both credit and noncredit students expressed high levels of satisfaction with the services they received in their respective colleges, as shown in the second figure in Exhibit 7-7.

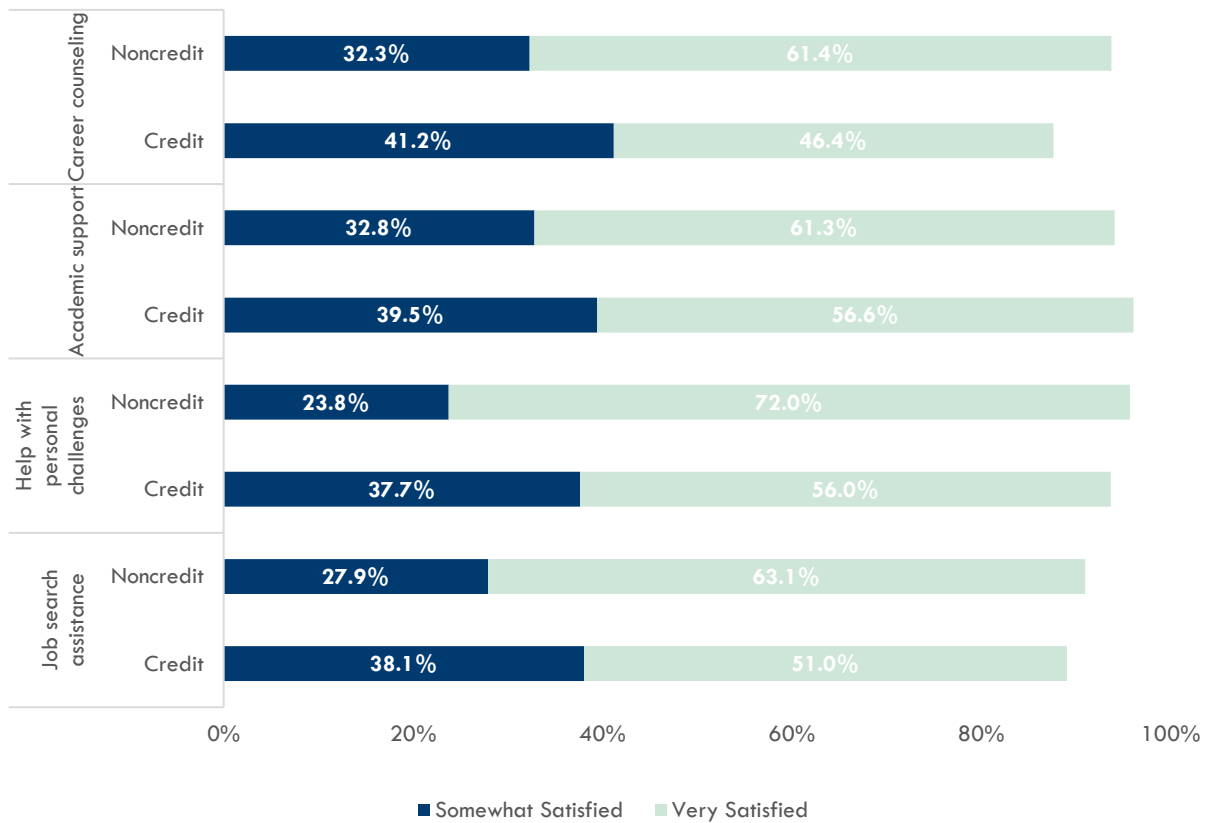


**Figure 7-7: Service Receipt and Satisfaction with Program by Type of Program**



\*Note: difference is significant at  $\alpha = 0.10$ .

Are you satisfied with ...?



Source: AMMQC Completer Survey.

## *Academic Outcomes*

We now turn to two primary academic outcomes of participants: retention and completion. Retention is defined as still being enrolled in the program at the time the data were collected, and completion is defined as successfully completing the program in which the participant enrolled and receiving a credential. In the subsections below, we first describe the outcomes in the aggregate, and then describe different factors associated with participants' retention and completion rates, adjusting for participants' individual characteristics.

### **Aggregate Outcomes**

From fall 2013 through the end of the grant-funded period in spring 2017, AMMQC served 1,745 unique participants who enrolled in a variety of noncredit and credit programs. As Exhibit 7-8 shows, most of those who enrolled in noncredit programs completed their programs (89.1 percent); only a very small percentage were still enrolled by the end of the grant (<1 percent), and 10 percent exited the program without receiving a credential. Completion rates for most individual noncredit programs were around 90 percent.

By comparison, slightly fewer than half (47.3 percent) of participants who enrolled in credit programs completed them and earned a credential, about a quarter (27.6 percent) of them exited before completing, and about a quarter (25.1 percent) were still enrolled at the time of the last administrative data extract (March 2017). Further, completion and retention rates were noticeably different for those who enrolled in certificate programs and those who enrolled in degree programs. Participants who were enrolled in certificate programs, which typically take one year or less to complete, were more than twice as likely to complete their programs as those enrolled in associate degree programs (64.2 percent versus 26.7 percent, respectively). Additionally, participants who were enrolled in certificate programs were also much less likely to exit before completion than those enrolled in degree programs (16 percent versus 41.6 percent, respectively). Most of the 19 participants who enrolled in both noncredit and credit programs were still enrolled in their programs at the time of data collection.<sup>43</sup>

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<sup>43</sup> Academic outcomes for participants who took only one or two AMMQC grant-funded courses but were not enrolled in AMMQC programs are incomplete due to data availability and data inconsistencies. They are therefore not shown in Exhibit 7-8.

**Figure 7-8: Enrollment, Retention, and Completion by Type of Program**

	Total Participants	Still Enrolled in Program	Completed Program	Exited Before Completion
<b>Noncredit and Credit Programs</b>				
<b>Total Noncredit Programs</b>	<b>1,120</b>	<b>0.9%</b>	<b>89.1%</b>	<b>10.0%</b>
Industrial Readiness Training (IRT)	835	0.2%	87.1%	12.7%
Quality Systems Training (QST)	122	0.8%	96.7%	2.5%
Industrial Readiness Training and Quality Systems Training*	56	1.8%	91.1%	7.1%
Automation Technician Training (ATT)	14	-	100.0%	-
Lean Six Sigma Yellow Belt (LSS)	79	-	98.7%	1.3%
ISO Internal Auditing	14	-	92.9%	7.1%
<b>Total Credit Programs</b>	<b>430</b>	<b>25.1%</b>	<b>47.3%</b>	<b>27.6%</b>
Certificates	236	19.8%	64.2%	16.0%
Degrees	194	31.8%	26.7%	41.6%
Enrolled in Both Noncredit and Credit Programs	19	89.5%	5.3%	5.3%
<b>Consortium</b>	<b>1,745</b>			

\*All participants who enrolled in both IRT and QST and exited before completing both programs did complete one of the programs.

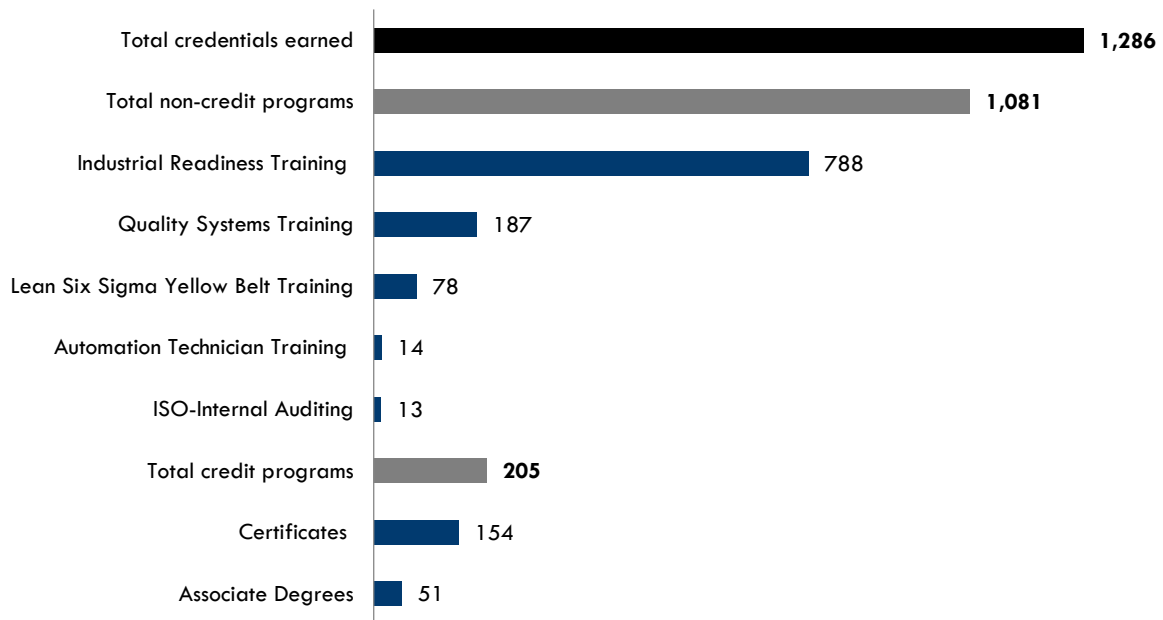
Source: March 2017 college administrative data.

During the grant period, participants earned a total of 1,286 credentials from noncredit and credit programs, with some earning more than one credential. As shown in Exhibit 7-9, most credentials obtained were in noncredit programs (n = 1,081). Among noncredit programs, Industrial Readiness



Training (IRT) was the most common type of credential that participants earned. This was followed distantly by Quality of Systems Training (developed by MWCC) and Lean Six Sigma Yellow Belt (developed by STCC) credentials. Among credit programs, certificate credentials were awarded more often than degree credentials (n = 154 and n = 51, respectively).

**Figure 7-9: Total Number of Credentials Earned in Each Program**



Note: Data include all academic credentials earned across all enrollees, including multiple credentials earned by the same participant.

Source: March 2017 college administrative data.

## Factors Associated with Academic Outcomes

To provide a more complete picture of academic outcomes for AMMQC program participants, we examined individual- and group-level factors that could be associated with each of two desirable outcomes: participants' likelihood of remaining in the program and participants' likelihood of completing the program. To examine the associations between individual and program characteristics and academic outcomes, we estimated a multivariate model utilizing multinomial logistic regression.<sup>44</sup> This model was only estimated for participants in credit programs because almost all noncredit participants completed programs and very few were retained. Thus, there was insufficient variation in either of the outcomes to make analyses meaningful for these participants.

In multinomial logistic modeling, the log odds of the outcomes are modeled as a linear combination of predictor variables. In our case, we examined whether academic outcomes differed significantly among sociodemographic subgroups (age, gender, race/ethnicity), and whether they were associated with Pell Grant receipt and the type of credit program in which participants enrolled. Additionally, to capture the varied institutional contexts of AMMQC colleges, the model includes college fixed effects, which control for any time-invariant college-level factors (both observed and unobserved) that vary across AMMQC regions. Ultimately, we expected the exploratory analyses presented here to benefit from utilizing a multivariate framework because in addition to assessing the strength and magnitude of associations

<sup>44</sup> Multinomial logistic regression is an appropriate data analysis method because the dependent variable is a nominal variable.

between academic outcomes and various factors, we can also determine whether the associations hold once other factors are accounted for. In our model, dropping out of the program was selected as the “base” outcome category.

Exhibit 7-10 shows the factors that were significantly associated with retention. The results of the model indicate that male and black participants were less likely to remain enrolled in their programs. In addition, participants who were enrolled in degree programs, which take longer to complete, were no more likely to remain enrolled than participants in certificate programs. This result is unexpected and suggests that participating in a degree program is associated with additional challenges compared to a shorter certificate program. Therefore, students enrolled in degree programs may need additional support to alleviate the potential difficulties associated with staying enrolled.

Exhibit 7-10 also shows that several factors were significantly associated with completion. Men were 14 percentage points less likely to complete their programs than women. There were also differences in completion rates across race/ethnicity groups—black participants were less likely than white students to complete their programs. Receiving federal financial aid through a Pell Grant may also help participants successfully complete AMMQC programs, as this was associated with an eight percentage points increase in the likelihood of completion. In addition, compared to those enrolled in certificate programs, the completion rate of participants enrolled in degree programs was 28 percentage points lower. This is consistent with descriptive findings (Exhibit 7-8) showing differential completion rates for the two groups, and is a result of degree programs taking longer to complete than certificate programs.

**Figure 7-10: Multivariate Analyses of Completion**

	Retention	Completion
	<i>(dropout is base outcome)</i>	
<b>Individual Characteristics</b>		
Age (18–29 years old is reference category)		
30–39 years	2.3	-3.4
40–49 years	-12.3	11.8
50 years or older	-6.1	7.4
Male (female is reference category)	-6.0*	-13.6*
Race/Ethnicity (white is reference category)		
Hispanic/Latino	4.3	-3.6
Asian	-13.4	12.2
Black	-4.9*	-8.4*
Other	-5.3	-0.3
Pell Grant receipt	1.1	7.9*
<b>Program Characteristics</b>		
Degree (certificate is the reference category)	12.7	-27.3*
Constant included	Yes	
College fixed effects included	Yes	
Pseudo R squared	0.350	
<b>Observations</b>	<b>382</b>	

\*  $p < 0.10$

Note: Numbers represent changes in predicted probability of the outcome associated with a variable or category of a variable compared to the base outcome.

Source: March 2017 college administrative data.

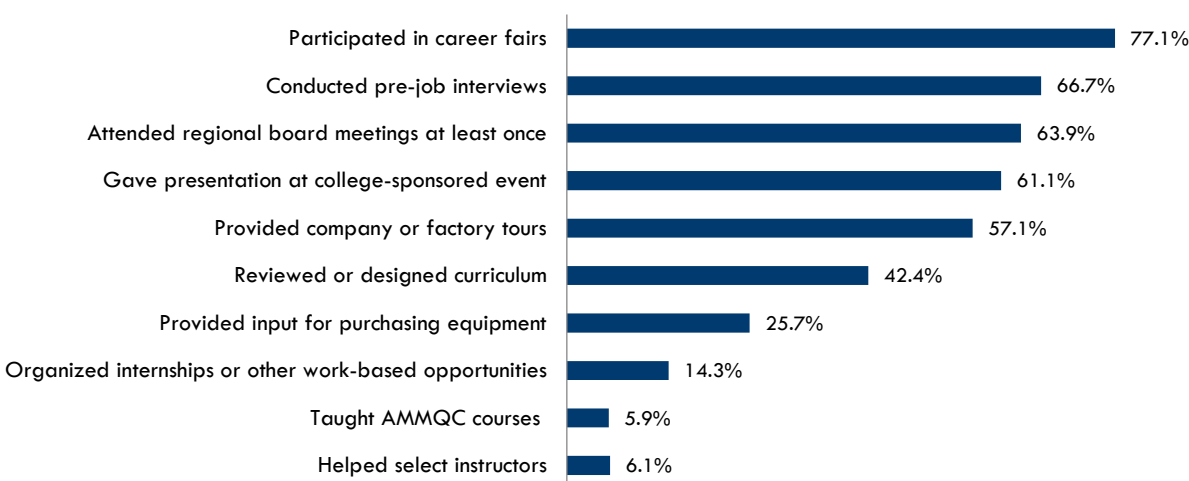
The findings from the multivariate model indicate that colleges could strengthen institutional strategies to support program completion and program retention for male and black participants. For example, colleges could employ early warning systems to detect students at risk of dropping out and offer comprehensive and integrated support systems to encourage completion.

## Employer-Level Outcomes

AMMQC featured employers as important stakeholders and beneficiaries of grant-funded programs and activities. This last section of the chapter describes outcomes of employer involvement in AMMQC activities as well as the benefits employers experienced through their participation. The data for this section come mainly from two sources: focus groups with employers at each of the four colleges and a survey of employers involved in AMMQC activities.<sup>45</sup>

AMMQC benefited considerably from engaging employers in consortium activities. Findings from the employer survey (Exhibit 7-11) show that they were involved in multiple activities including those related to jobs and careers (e.g., career fairs, assistance with job search, and conducting interviews with AMMQC students). However, employers tended to be less involved in academic-oriented activities such as teaching AMMQC courses or selecting instructors.

**Figure 7-11: Employers' Involvement in AMMQC Consortium Activities**



One type of activity in which employers participated less frequently was providing work-based learning opportunities. Only 14 percent of employers surveyed said that their company organized internships or other work-based learning opportunities such as job shadowing, internships, or apprenticeships. This can be considered as a missed opportunity for AMMQC because work-based learning is a useful way to introduce students to the world of work, and because students in the focus groups expressed interest in benefitting from such opportunities. An alternative way in which some employers introduced students to the hands-on nature of manufacturing positions was through factory/company tours; however,

<sup>45</sup> Details about the employer survey are offered in Appendix B, Employer Perspectives. An expanded description of employer perspectives is offered in the same appendix.

factory tours merely acquaint students with the job environment, and do not provide the on-the-job training necessary to enhance their skills.

In focus groups, some employers stated that their companies did not provide work-based learning opportunities due to safety or insurance concerns. These concerns are valid in advanced manufacturing because much of the equipment on which students would train is expensive and physical injury is a real possibility. (Coincidentally, this also appears to be a reason behind the preference toward the temp-to-hire model since temporary workers are insured by the temp agency, not the company.) Still, work-based opportunities are expected to provide substantial benefits for students, so finding ways to engage employers to provide this opportunity more often represents a clear opportunity.

Exhibit 7-12 summarizes the benefits experienced by employers from engaging with the colleges in AMMQC, as stated in the employer survey. More than half of employers were strongly satisfied with the curriculum content offered to students, about half were very satisfied with the instructional equipment offered to students and the effectiveness of the grant team promoting program graduates. Slightly more than a third (36.4 percent) of employers felt that the regional board meetings were very productive.

**Figure 7-12: Employers' Satisfaction with Certain AMMQC Consortium Activities**



Note: Exhibit reports only valid percentages and excludes missing respondents who were not asked the question.

Source: AMMQC Completer Survey.

In focus groups and interviews, employers indicated additional outcomes from engaging with AMMQC:

- **Engaging with colleges allowed employers to become better acquainted with the training programs offered in their communities.** Often, employers were not aware that certain AMMQC certificates or programs were available in their communities, and engaging with the college helped them to fill this gap in knowledge.
- **Engagement allowed employers to customize curricula and develop training programs for their specific company needs.** Doing so allowed them to address skills gaps such as lack of basic job skills or even advanced managerial skills.

## Summary of Findings

- **AMMQC improved participating colleges' capacity to provide training** for on-demand jobs in advanced manufacturing. AMMQC activities resulted in the creation or enhancement of a total of 24 programs—eight noncredit and 16 for-credit. AMMQC also led to significant increases in

the capacity of colleges to serve students, including new instructional equipment, new connections with employers, and virtual training software.

- **AMMQC colleges exceeded the quantitative enrollment and completion goals** they set out to accomplish during the grant period.
- **The consortium enrolled 1,745 students.** More than half of these students enrolled in noncredit programs, about one quarter enrolled in credit programs, and 10 percent participated in one or more single grant-funded courses.
- **Program completers who said they received staff assistance from grant staff expressed high levels of satisfaction** with the supports they received. Over 90 percent of participants said they were either very or somewhat satisfied with them. However, completers of noncredit programs tended to be more satisfied than completers of credit programs.
- **Most participants who enrolled in noncredit programs completed their programs.** By comparison, slightly fewer than half of the participants who enrolled in credit programs did so. Additionally, participants enrolled in certificate programs were much less likely to exit before completing their programs than participants who enrolled in degree programs.
- **A multivariate model of completion and retention showed** that men and African-American participants were less likely to both complete and stay enrolled in credit programs compared to women and individuals from other ethnic and racial groups. This suggests that colleges could strengthen institutional strategies to support program completion and program retention for male and black participants. In addition, receiving a Pell Grant was associated with an increase in the probability of completion. Students enrolled in two-year degree programs appeared to have additional barriers to retention compared to those in shorter certificate programs.
- **AMMQC benefited greatly from the involvement of employers** through job- and career-related activities such as career fairs, assistance with job search, and conducting interviews with AMMQC students. Employers tended to be less involved in academic-oriented activities such as teaching courses or selecting instructors (although they were more involved in shaping curricula).
- **Employers provided very few work-based learning opportunities.** Only a few of the employers surveyed said that their companies organized internships or other opportunities such as job shadowing, internships, or apprenticeships. This is a missed opportunity for AMMQC because work-based learning opportunities are a useful way to introduce students to the world of work.
- **More than half of employers were strongly satisfied with the curriculum content** offered to students, about half were very satisfied with the effectiveness of the grant team promoting program graduates and the instructional equipment offered to students, and slightly more than a third of the employers surveyed felt that the regional board meetings were very productive.



## CHAPTER 8: AMMQC'S IMPACTS

This chapter draws on data collected during the evaluation to assess AMMQC's impact on individual participant outcomes. We describe the USDOL's evaluation expectations for TAACCCT impact assessment, then go on to describe the research design. We then summarize the main findings from the impact study and present conclusions.

### Designing an Impact Evaluation for AMMQC

USDOL stressed the importance of a rigorous impact evaluation to estimate TAACCCT-funded program impacts on participant outcomes using experimental or quasi-experimental methodologies. In an impact study, outcomes of participants are compared with the outcomes of a group of non-participants to estimate the effect of the initiative.

In the case of AMMQC, estimating impact is not equally relevant for all outcomes and all participant groups. In particular, a distinction should be made between participants in noncredit and credit programs and types of outcomes that are relevant for estimating impact for each group. For noncredit AMMQC participants, completion of the program is not a relevant outcome because almost all individuals who enrolled in these programs completed them (see Chapter 7). In addition, noncredit programs are short programs specifically built to lead to employment. Therefore, the impact of participating in AMMQC noncredit programs on labor market outcomes (employment status and earnings) is an outcome of conceptual and policy interest.

For credit program participants, completion is an important outcome to study because we know program dropout rates are high in this group (particularly for participants in degree programs, as shown in Chapter 7). Therefore, we wanted to know if AMMQC for-credit programs helped participants complete at a higher rate compared to before the initiative. In addition, a case can be made that labor market impacts associated with TAACCCT cannot be observed for a person who has not yet graduated because he or she has not been exposed to the full treatment. However, the only college for which post-program employment and earnings data were available was NCSC, and that college had fewer than 20 for-credit completers at the time we received the data. Thus, because of the very small size of the participant sample, a decision was made not to estimate impacts on labor market outcomes for this group.

### AMMQC Impacts for Noncredit Program Completers

As stated above, the only AMMQC college that could access earnings data from its state Unemployment Insurance (UI) agency was NCSC. Therefore, estimating impacts on employment for noncredit program completers was only possible for this college. The treatment group consisted of all noncredit (IRT) program completers from NCSC. Because NCSC did not offer any similar noncredit programs—either before or concurrently with IRT—a comparison group could not be selected from other students at the college. Instead, a decision was made to select the comparison group from individuals who participated in workforce development programs funded by the Workforce Innovation and Opportunity Act (WIOA) Adult and Dislocated Worker funds. However, because the main goal was to estimate the impact of IRT on employment, we decided to select WIOA participants who received career services but not training, because these services, like IRT, are usually short. In effect, the research question was whether IRT completers fared better than WIOA program participants who received career services but no training.

To increase comparability, only WIOA participants with an enrollment date after January 1, 2014 (when the first IRT participants at NCSC were enrolled) were selected in the comparison group.

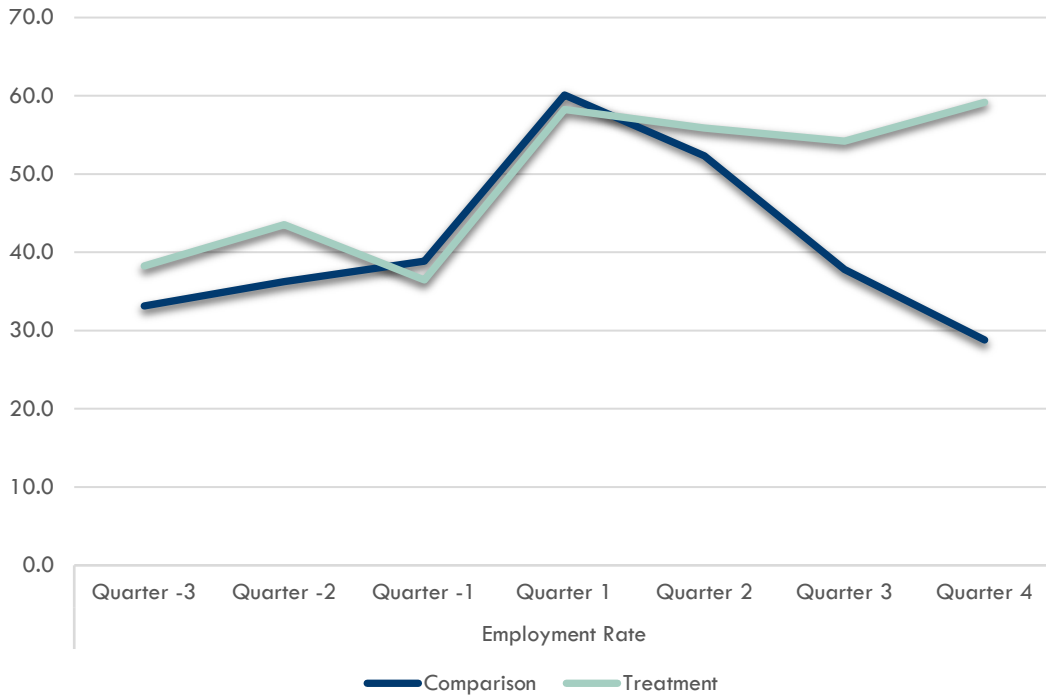
Data on IRT participants' employment rates were obtained by NCSC from the Ohio Department of Job and Family Services (ODJFS), and shared with SPR after personally identifiable information was removed from the file. Data on WIOA participants' demographic characteristics and employment rates were obtained from WIOA public use files available from USDOL for multiple program quarters.<sup>46</sup> To control for regional characteristics, we selected WIOA participants from the local areas operating in the NCSC region. In addition, to ensure comparability, we restricted the sample to only WIOA participants who enrolled in and exited the program in the same quarter (since IRT was intended to last about a month, as described in Chapter 5).

One strategy to assess impacts is to visually inspect differences in employment rates between the treatment and comparison groups over time. For everyone in the analysis sample, employment status was calculated for three pre-participation quarters and four post-participation quarters (determined by everyone's enrollment quarter). Plotting employment rates by quarter reveals a differential pattern between the two groups (Exhibit 8-1). Although employment patterns for the two groups were similar during the pre-participation periods, and employment rates in both groups climbed in Quarter 1 after participation—and did so almost identically for the two groups—in Quarter 2 the patterns for the two groups began to diverge. Whereas employment rates in the treatment group stayed at relatively the same level (and even increased slightly in Quarter 4), employment rates in the comparison group declined abruptly, such that by Quarter 4 the difference between the two groups was more than 30 percentage points. In other words, IRT participants tended to be employed at a much higher rate compared to WIOA participants who received no training.

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<sup>46</sup> <https://www.doleta.gov/performance/results/>.

**Exhibit 8-1: Employment Rates by Participation Quarter\***



\*Employment rates for Quarters 3 and 4 were calculated by restricting the sample to only the participants for whom employment data could be available based on the date of enrollment.

Despite the suggestive evidence presented above, the treatment and control groups could differ in ways that might be associated with employment. To control for these discrepancies, we employed a comparative interrupted time series (CITS) model to estimate IRT impacts. The CITS model compares, for both the treatment and the comparison group, the trend in the outcome in the pre-period to the trend in the outcome in the post-period. The deviation from the pre-period trend for the treatment group minus the deviation from the trend for the comparison group is the estimated effect of the intervention. This approach has been shown to effectively control for differences between groups.<sup>47</sup>

Specifically, we estimated the following model:

$$(1) Y_{at} = \alpha + \beta t + \lambda T_{at} + (t * T_{at}) + \sum \delta_k \text{POST}_k + \sum \theta_k (T_{at} * \text{POST}_k) + \pi X_{at} + \varepsilon_{at},$$

where  $Y_{at}$  is the outcome (employment status or earnings) for group  $a$  at time  $t$ ;  $t$  is the time period centered at the last pre-period (because three quarters of data were available before participation in IRT and WIOA and four quarters were available after completion,  $t$  ranges from -3 to +4);  $T_{at}$  equals 1 for the treatment group and 0 for the comparison group;  $\text{POST}_k$  equals 1 for post-period  $k$  and 0 otherwise (in the above example,  $k$  would range from 1 to 4 and  $\text{POST}_k$  equals 1 for each of the four post-intervention quarters and 0 for all pre-intervention quarters);  $\alpha$  and  $\beta$  equal the intercept and slope of the pre-intervention trend for the comparison group;  $(\alpha + \lambda)$  and  $(\beta + \gamma)$  equal the intercept and slope of the pre-intervention trend for the treatment group;  $\delta_1, \delta_2, \delta_3, \dots$  represent the deviation from the trend for the comparison group in post-periods 1, 2, 3, etc.;  $\theta_1, \theta_2, \theta_3, \dots$  represent the estimated effects in post-periods 1, 2, 3, etc.—the deviation from the trend for the treatment group minus the deviation

<sup>47</sup> St. Clair, Cook, & Hallberg (2014).

from the trend for the comparison group;  $Xat$  is an optional vector of other individual characteristics for which we want to control (gender, age, and race/ethnicity); and  $\varepsilon at$  is an error term. To control for regional trends that affected both groups, year fixed effects were added to the model. The results of the model are displayed in Exhibit 8-2 below.

**Exhibit 8-2: Model of IRT impact on Employment**

	Employment
Impact Q1	9.2
Impact Q2	22.8
Impact Q3	38.9*
Impact Q4	54.2*
Pre-intervention trends included	Yes
Covariates included	Yes
Constant included	Yes
Year fixed effects included	Yes
Pseudo R squared	0.062
<b>Observations**</b>	<b>2,044</b>

\*  $p < 0.10$

\*\* Repeated observations (seven per individual).

Note: Numbers represent changes in predicted probability of the outcome associated with a variable or category of a variable compared to the base outcome. Robust standard errors.

Sources: ODJFS; USDOL; NCSC administrative data.

After controlling for covariates and time fixed effects, the results of the CITS model confirm the findings from visual analysis conducted above. The regression-adjusted impacts for Quarters 3 and 4 are much larger than the unadjusted impacts seen in Exhibit 8-1. This difference is likely a result of controlling for pre-intervention trends and compositional differences between groups.

Based on the available data, we can tentatively conclude that NCSC participants who began IRT appeared to fare substantially better compared to WIOA participants who received no training. From the perspective of the college, it is particularly encouraging that employment rates did not taper off after one quarter or two from participation, as is typical for brief training programs. This is particularly positive since, as discussed in Chapter 6, NCSC's recruitment strategy for IRT was to cast a wide net, which resulted in many program participants with substantial barriers to employment (including ex-offender status, substance abuse issues, and low income). This finding suggests that impacts of programs that provide training and intensive wraparound staff-assisted services on employment can be considerable for these populations.

Although this finding was relatively robust to several alternative model specifications (not shown, but available on request), the results should be regarded as preliminary. First, since employment data on program participants were only available from one college, the findings cannot be generalized to AMMQC as a whole. In addition, the relative paucity of available covariates means that important differences between the groups could be unaccounted for. Third, longer observation periods (both before and after the intervention) might yield more precise estimates. Lastly, impact might be dependent on the choice of comparison group.

## AMMQC Impacts for Students Enrolled in Credit Programs

The driving research question for the impact study of credit programs was whether the infusion of AMMQC funds led to meaningful program improvements that benefitted students compared to what existed before. The logic was that this appeared to be the most relevant policy question associated with the initiative. A standard approach would compare the outcomes of TAACCCT students to the outcomes students would have obtained in the absence of the program. From a policymaking perspective, however, this is not the most relevant question because the TAACCCT initiative did not arrive in a vacuum—there had been prior attempts to build career pathways, often through prior rounds of TAACCCT funding and other state and local initiatives. Our research question addressed this context directly.

Because the research question was formulated in this way, a sharp distinction should be drawn between new and enhanced programs of study. If a program was pre-existing and was enhanced by TAACCCT, it is feasible and useful to ask what impact the enhancements had by comparing the outcomes of TAACCCT students to prior cohorts of students (those served before the enhancements were introduced). Assessing new programs is more challenging because it is more difficult to estimate the counterfactual (i.e., what would have happened if students did not enroll in the TAACCCT program). Therefore, our impact design for AMMQC was focused on evaluating the impact of enhanced programs.

For the estimation of TAACCCT program enhancements on student academic outcomes, we employed a difference-in-differences (DID) model that compared differences in average outcomes over time for the program group to differences over time for the comparison group. This design potentially controls for factors affecting student outcomes that were not associated with TAACCCT enhancements. It also increases the chance that differences in outcomes before and after TAACCCT enhancements were because of the enhancements and not due to other phenomena (e.g., an economic upturn, which may cause people to search for jobs rather than enroll in college).

After a careful evaluation of program offerings at each college and several discussions with grant teams and institutional research directors at each college, we identified several comparison programs that were similar in terms of length, typical student profiles, and occupational characteristics to the enhanced TAACCCT programs that we were evaluating. We then requested data extracts containing students who enrolled in these programs beginning October 1, 2011 (two years before the TAACCCT program began) and any time afterwards. Only programs for which data existed both before and after AMMQC were kept in the sample. Finally, we requested two years of pre-intervention data for programs that were later enhanced using AMMQC funds.

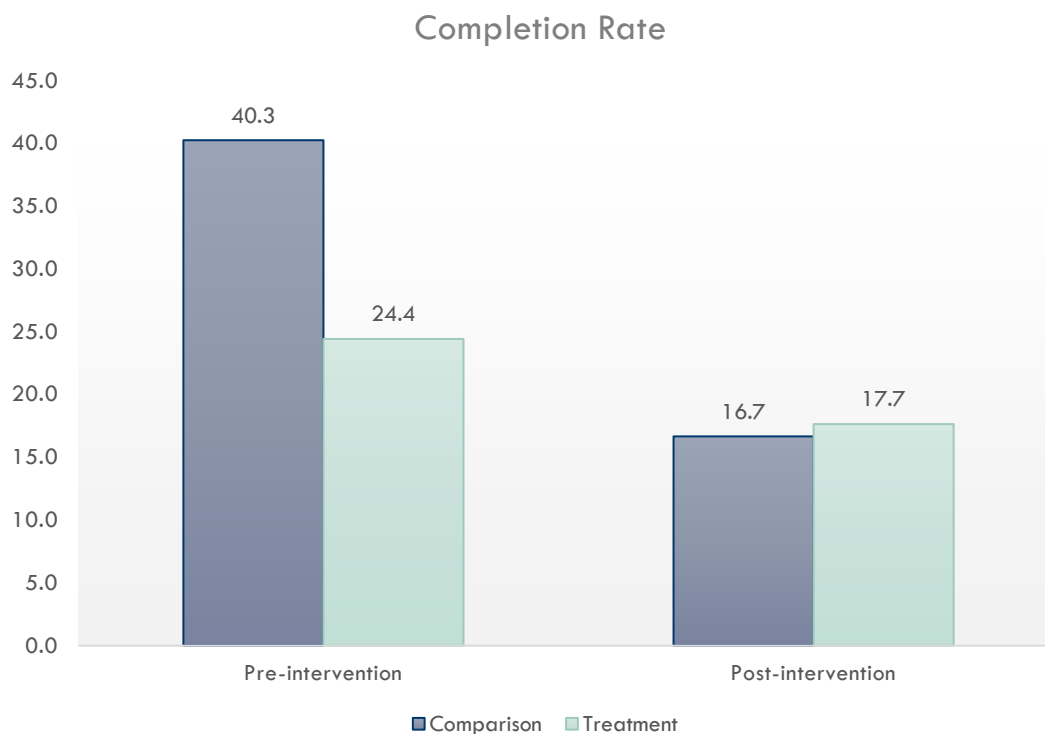
The decision to estimate impacts only for enhanced credit programs eliminates BPCC students from the sample since this college only implemented new credit programs. In addition, STCC did not provide any comparison data. Therefore, the only two colleges that could be included in this component of the impact study were MWCC and NCSC.

A few data manipulations were necessary before we could analyze them. We eliminated duplicates from the NCSC comparison data by removing all instances where a student obtained a certificate on the way to achieving a degree. For these cases, only the completion of the terminal degree was retained in the file.

Program impacts can be calculated by simply averaging completion rates for the treatment and comparison groups before and after the AMMQC intervention started, and calculating the difference in differences between the means. However, one important adjustment was necessary: In our sample, the proportion of participants who enrolled in various programs differed markedly for pre-intervention and

post-intervention periods—for example, Electrical Maintenance, an AMMQC enhanced program, comprised 26 percent of the treatment sample in the pre-intervention period but 54 percent of the treatment sample in the post-intervention period. If different programs have different completion rates, then the compositional change of the groups over time could distort the DID comparison. To deal with this potential problem, we computed weights that equalized the distribution of programs in the two groups. This way, we ensured that changes in completion rates over time were not influenced by the proportions of programs in the sample. Exhibit 8-3 below shows completion rates for the two groups after weighting.

**Exhibit 8-3: Impact of Enhanced Programs in Two AMMQC Colleges**



The data show that both groups had a higher completion rate in the pre-intervention period than in the post-intervention period. This is a normal result of censoring that occurs because, at the time the data were collected, the post-intervention students had had less time than pre-intervention students in which to complete the program. Because there is no reason to believe that this problem affected the research groups differently, the DID design should have controlled this problem effectively. In addition, the comparison group had a higher completion rate than the treatment group in the pre-intervention period, and post-intervention completion rates were almost equal. Therefore, the calculated impact without controlling for baseline variables is  $(17.7 - 24.4) - (16.7 - 40.3) = 16.8$  percentage points. In other words, it appears that AMMQC enhancements had a positive impact on completion.

Program impact could be affected by individual characteristics that are not related to the program, however. To deal with possible confounding factors, we estimated a logistic regression model that controls for background characteristics (race, age, gender, and college):

$$(2) Y = \alpha + \beta_1 \text{AGE} + \beta_2 \text{GENDER} + \beta_3 \text{RACE} + \beta_4 \text{MWCC} + \beta_5 \text{AMMQC} + \beta_6 \text{POST} + \beta_7 \text{DID},$$

where Y is a dummy variable denoting completion (1 if the student completed the program, 0 if otherwise); AMMQC is a dummy for whether the graduate was in AMMQC versus the comparison cohorts; POST is a dummy variable for whether data are for a cohort that exited after October 1, 2013, and later (0 if prior to that date); and DID is an interaction between these latter two variables. The coefficient  $\beta_7$  is the coefficient of interest: Are completion rates greater for program cohorts that exited after AMMQC was initiated than they would be otherwise. The regression estimates were weighted using the program weights described above. The results are displayed in Exhibit 8-2 below.

**Exhibit 8-4: Regression-Adjusted Impact of AMMQC Enhanced Programs\***

	Completion
Impact	13.3
Covariates included	Yes
Constant included	Yes
College fixed effects included	Yes
Pseudo R squared	0.055
<b>Observations</b>	<b>423</b>

\*  $p < 0.10$

Note: Numbers represent changes in predicted probability of the outcome associated with a variable or category of a variable compared to the base outcome. Robust standard errors.

Source: March 2017 college administrative data.

After controlling for potential confounders, the adjusted impact was slightly smaller than the unadjusted impact calculated before (see Exhibit 8-1), but it is statistically insignificant. One of the possible causes for this result is low statistical power. Statistical power refers to the ability of a significance test to confidently detect an effect when in fact an effect exists. Among the factors that determine statistical power, two of the most important are the study's sample size and the size of the effect one is trying to detect. Although other factors can certainly have contributed to this statistical insignificance—for example, the enhancements may have not been extensive enough to impact completion rates, but may have contributed to an increase in hands-on skills or other outcomes we were not able to measure—overall this result is encouraging and points to the need to continue enhancing programs that respond to employer and student needs.

Besides limited statistical power, a limitation of this analysis is that it does not include data from STCC, thus reducing our ability to extrapolate the validity of the findings to the consortium as a whole. Another methodological limitation is that the DID design allows units of analysis to differ for pre- and post-intervention periods. A standard DID design assumes that the treatment and comparison units (usually aggregate-level units like schools or counties) are the same before and after the intervention. In our case, however, this condition is violated because the treatment and comparison groups differ internally between the pre- and the post-intervention period. Although this problem is somewhat mitigated by the addition of covariates and by weighting, residual differences between groups might still exist.

## Summary of Findings and Lessons Learned

- **NCSC participants who began IRT appear to have substantially higher post-participation employment rates than WIOA participants from the same region who received no training.**

From the perspective of the college, it is particularly encouraging that employment rates do not taper off after one quarter or two from participation, as is typical for brief training programs. This is particularly positive since many IRT program participants had substantial barriers to employment (including ex-offender status, substance abuse issues, and low income). This finding suggests that employment impacts of programs that provide training and intensive wraparound staff-assisted services can be considerable for these populations.

- **Enhancing credit programs at two AMMQC colleges appeared to lead to a small increase in completion rates** compared to pre-enhancement programs, as measured using a comparison group of students who enrolled in programs that were similar in terms of length, typical student profile, and occupational characteristics to the enhanced TAACCCT programs. However, the impact was statistically insignificant.
- **Career pathways systems and infrastructures built by AMMQC were still at the incipient stage**, and therefore estimations of individual-level impacts may be premature.
- **More complete impact analyses might benefit from improved data collection systems.** Because of data unavailability, the impact of AMMQC on several important outcomes, such as transitioning from one level of career pathways to other levels, could not be conducted. AMMQC colleges should continue to improve the quality of their data by enhancing the quality of systems that track students enrolled in noncredit programs, integrating the systems that track for-credit and noncredit students, and negotiating data sharing agreements with state UI agencies and local workforce and welfare agencies to access employment and earnings data on career pathways participants.



## CHAPTER 9: SYNTHESIS

All colleges that participated in this initiative hoped to use TAACCCT funds to establish career pathways that would train individuals at different stages in their careers for in-demand occupations within their regional advanced manufacturing sectors. In this chapter, we reflect on the colleges' implementation experiences and program outcomes to a) understand how the regional and institutional context affected career pathways development; b) ascertain what strategies were particularly promising in implementing specific elements of pathways successfully; and c) discuss future strategies that hold the potential for higher performance.

### Factors that Shaped the Success of the AMMQC Projects

#### *Regional Economic Conditions: Enhancing Manufacturing Programs in a Time of Gradual Economic Recovery*

The regional economies of colleges involved in the AMMQC initiative were very diverse. MWCC and NCSC were building on historically strong manufacturing sectors in their regional economies, while BPCC and STCC historically had a more modest manufacturing presence. But even within each of these two groups, marked differences existed. MWCC was situated in a large metro area with dense advanced manufacturing networks, whereas NCSC was in a more suburban rustbelt area recovering from dislocations resulting from a major automotive plant closure during the Great Recession. And although both BPCC and STCC were in regions without strong manufacturing traditions, STCC benefitted from its location in a major metropolitan area that was a major shipping and distribution hub on the Mississippi River, while BPCC was in a semi-rural area that was in the midst of a decline of the fracking industry.

The differing local contexts shaped grant implementation significantly. The degree of employer involvement varied across the regions: the more developed and industrially vibrant a region's manufacturing base was, the more opportunities existed for employer engagement and the forming of regional alliances conducive to career pathways development in advanced manufacturing. For example, for MWCC, the Worcester–Greater Boston area had several advantages in this regard. The presence of many companies in the area that were expanding and innovating meant MWCC could direct its outreach efforts to a larger number of potential partners. In addition, the active engagement of employers in the region's Manufacturing Roundtable, a regional employer association, and other business intermediaries facilitated the MWCC grant team's access to the entire business community. Lastly, the fact that the business community in manufacturing was diverse and self-organized meant that the grant team did not have to depend on few selected companies for the success of its entire effort. By contrast, the lower company density in the NCSC area made it more difficult for its grant team to connect to many employers. And even when industry associations existed, a narrow, single-industry focus (for example, medical devices in the case of STCC) meant that the business intermediaries could not provide a gateway to a diverse business audience.

The regional economic context was also important during grant implementation because it influenced the extent to which employers and community college faculty embraced new industry-recognized credentials and the extent to which they used them to assess the quality of potential hires. For example, when employers were late in adopting new technologies, often they were not aware of the credentials or the content and testing processes the students went through to receive it.

The fact that some regional contexts were more favorable to developing advanced manufacturing career pathways initiatives does not mean that these initiatives should not be pursued in regions that seem to lack favorable conditions. However, our findings suggest that these regions may need additional support to facilitate implementation success. In this context, Louisiana Economic Department's high level of involvement in supporting AMMQC grant implementation by facilitating connections with employers stands out as a promising practice. It suggests that active and entrepreneurial public agencies can, to some degree, compensate for some of a region's more adverse conditions.

### *The Institutional Context of Manufacturing Training Programs in AMMQC Colleges*

Together with regional differences, many important differences existed between how AMMQC colleges were organized. In many respects, these institutional ecosystems—each with many competing priorities—shaped (and in some cases facilitated) the potential for full AMMQC implementation. Some of the key differentiating factors were the organizational position of the grant team within the larger college's governance structure, the level of stability of college leadership, the existence of institutional silos between credit (academic) and noncredit (workforce) programs, and the effectiveness of human resource processes and policies.

**The organizational position of the AMMQC grant team within the college affected ease of implementation.** MWCC's grant team was positioned at a very high level within the college governance structure, because the consortium director was a vice president with a long history at the college and easy access to the college president and other top decision makers. As discussed in the case study for MWCC, this access meant the grant team had an easier time making grant-related changes that required administrative backing than the rest of the grant teams at other colleges. It also appeared to be associated with the emphasis that the college was putting on workforce development more generally. (At the other colleges, workforce development was traditionally regarded as a secondary focus to credit programs.) MWCC experienced smoother implementation including fewer staffing shortages, on-time approval of grant-funded programs, and better-defined career pathways. For other grant teams, a more distant relationship to college leadership affected their ability to implement some of the more institutionally complex aspects of the AMMQC initiative.

**Stability of college leadership facilitated program development.** Stable college leadership was conducive to smoother implementation and better career pathways development. College-level governance at MWCC, NCSC and BPCC was stable throughout the grant period. By contrast, STCC experienced a significant change in college leadership in the middle of AMMQC implementation, which had vast implications for the implementation process including significant staff shortages and slow program development. The reorganization of academic divisions at NCSC, which took place during the grant period, also led to some significant delays, especially for the development of credit programs, although it did not rise to the level of STCC's challenges.

**Institutional separation between noncredit and for-credit activities can cause barriers.** None of the AMMQC colleges had a tradition of collaboration between their noncredit and credit divisions, which could have helped form bridges between programs that were developed within these divisions. The historical separation of these activities has been widely documented as a barrier to forming career pathways for nontraditional students.<sup>48</sup>

**Flexible, responsive human resource processes can aid implementation.** Community colleges overall often have difficulty recruiting and retaining qualified faculty, especially during times of declining

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<sup>48</sup> Van Noy et al. (2008).

enrollment (as was the case during AMMQC implementation) when funding constraints limit their ability to offer salaries competitive with those available in the private sector. In addition, the AMMQC colleges' human resources processes for hiring and retaining staff varied, and the responsiveness and flexibility of the institution in this regard had a significant influence on grant staffing and consistency. Staff turnover was noticeably lower at MWCC compared to other AMMQC colleges, with many staff members holding their positions throughout most of the grant period and many staff members requiring relatively little time to replace once they departed. This can be attributed to relatively flexible hiring practices that required fewer bureaucratic “hoops” to jump through. By contrast, STCC's difficulties in hiring a credit instructor in a timely fashion stemmed in large part from bulky and cumbersome hiring procedures and the inability for the college to offer a competitive package.

Regional and college governance characteristics were consequential for shaping which aspects of AMMQC moved forward smoothly and which were more challenging. The case studies highlighted the value of situating AMMQC implementation achievements within the constraints and opportunities under which the grant teams were working since they were mostly outside of the control of the grant teams. However, we do not wish to suggest that funders such as USDOL should only invest in colleges that already have strong institutions, since it is often the colleges with challenges in this regard that could potentially benefit more from grant funding. Perhaps future grant programs could consider the level of institutional stability and history of similar grants in deciding how funds should be allocated (e.g., by allowing longer lead time to colleges that are new to career pathways development so they can hire more staff members and train them in how to engage employers, how to perform tracking and performance monitoring, etc.).

## Moving the Needle on Career Pathways Development

This section looks more deeply at several of the key components of the career pathways approach to analyze common themes and differences in how the consortium colleges made progress on adopting them—what worked, what didn't work, and why. As described in Chapter 1, the reason that USDOL invested in TAACCCT grants like AMMQC in the first place was to make the community college career training system better aligned with current industry needs and to improve access for trade-affected workers and other nontraditional students. The underlying theory driving TAACCCT investments was that this shift would require a sector-based, career pathways approach that was attentive to multiple service gaps in the existing system. Chapter 2 outlined the components of career pathways models as they are understood in the literature and the specific logic model that guided AMMQC. In contrast, this section focuses on the components of implementation that supported desired institutional changes *in practice* at the AMMQC colleges. Some of these components have been established as key components of a pathways system within the literature, but others have not received as much attention. Given the fact the most of the AMMQC colleges were in the early stage of career pathways implementation at the start of the grant, these findings suggest ways to focus efforts on building a strong foundation for institutional change.



## Staffing

**Well-connected project managers have greater leverage.** Colleges that built AMMQC staffing structures on existing faculty and staff expertise that could be sustained after the end of grant funding were more likely to achieve their goals. Arguably, one of the main reasons why MWCC's grant implementation was on time and met most of its targets was that both the national consortium director and the regional project manager had been with the college for many years and had formed extensive networks inside the college's structure. This gave visibility to grant activities at MWCC and ensured that grant-related requests would be heard by the college administration. By comparison, other AMMQC colleges hired regional project managers who had little exposure to the community college environment or who were not familiar with the institution. In these cases, project managers needed time to learn where to direct their requests and, more importantly, time to build relationships with relevant college offices and stakeholders. Appointing project managers who are well acquainted with college procedures and have formed relationships with key stakeholders appears to be a promising practice.

**Braided funding can help with staff retention.** To promote sustainability of grant activities, an important feature of grant-funded programs is to retain grant staff who have accumulated knowledge about various career pathways development strategies. However, it appeared that at the end of the grant period very few AMMQC staff members were going to be retained at their colleges, leading to a potential loss of institutional knowledge. For future similar initiatives, the ability to retain staff appears as an important consideration. One strategy that might contribute to staff retention is to encourage more braiding with other funding streams that the colleges receive, rather than promoting short-term hires.

## Recruitment and Intake

Colleges benefited from recruitment and intake practices that were effective in increasing the awareness of advanced manufacturing careers among potential students—including not only displaced workers and older students, but also young people completing high school.

**Using diverse recruitment strategies and partners helps with recruitment.** Although AMMQC colleges struggled to meet their enrollment targets at first, they were ultimately successful in achieving them (for the most part), largely because they:

- Experimented with a variety of new recruitment strategies, including radio and television spots, and developed strong referral relationships with community organizations;
- Enhanced partnerships with their local workforce development boards and American Job Centers to generate referrals and braid funding for training;
- Piloted shorter entry-level trainings, such as Lean Six Sigma, that were offered on varied schedules to provide flexibility to students with different needs;
- Benefited from word of mouth once several cohorts of students started going through the program; and
- Partnered with temporary staffing agencies to quickly find and place candidates for IRT programs.

Individual colleges also learned valuable lessons about recruitment. For example, STCC learned that it was risky to embrace a single employer early in the grant for recruitment. This created difficulties when the employer changed hiring strategies and abandoned the partnership.

**An overreliance on temporary employment agencies can be problematic.** Several colleges learned that dependence on temporary employment agencies as a placement strategy could be counterproductive.

While temporary employment agencies might generate higher initial employment numbers, feedback from students, staff, and employers indicated that the overall goals of temporary employment agency partners were focused less on career ladders for students and more on immediate hiring needs. Students did not perceive these as good quality jobs or positions worth leaving existing jobs for.

***Building stronger pathways between credit and noncredit programs meets training needs for those with barriers.*** All AMMQC colleges struggled to strike an effective balance between increasing access to training for populations with barriers to employment (as evidenced by NCSC's IRT programs) and screening out people with employment barriers to cultivate program completers that employers felt were ready to work. Serving individuals with learning and employment barriers is more resource-intensive, although, as shown in Chapter 8, has the potential to generate positive impacts on employment. In addition, in the long run, serving such individuals could promote more skill development and therefore represents an appealing option for fixing the middle-skills gaps described in Chapter 1 of this report. Future grant initiatives like AMMQC could encourage the participation of more individuals with barriers by giving grant applicants higher scores for planning to serve such individuals.

***Recruitment of credit students could be expanded.*** Although participating colleges spent a substantial amount of time trying to recruit participants for noncredit programs, they focused considerably less on recruiting participants for credit programs. This is understandable since most of the planned participants in AMMQC were expected to enroll in noncredit programs. Nevertheless, the difficulty that some consortium colleges had in recruiting credit participants suggests that a more balanced approach that specifically targets credit students might go a long way toward ensuring sustainability of programs. Career pathways development that successfully transitions noncredit program completers to credit programs could be an important component in this approach.

### *Student Support and Job Placement*

***The resume café and speed interviews appear to be effective support strategies.*** AMMQC colleges utilized a wide variety of strategies aimed at assisting students in navigating academic and personal issues as well as preparing them for future work and career development. As shown in Chapter 7, students were very appreciative of the support they received. Although a combination of strategies appeared to work best, the resume café and speed interviews (see Chapters 3 and 4) seemed especially promising. These strategies were pioneered by BPCC and adopted by MWCC. Students who participated in these events gave glowing reviews, and we therefore highlight them as a promising practice.

***Better support services for students enrolled in credit programs could help with retention.*** As in the case of recruitment, most AMMQC colleges focused on offering staff-assisted services to noncredit participants (with the notable exception of BPCC, which prioritized credit program participants). Again, where possible, a more balanced approach in serving participants might yield potential benefits. As seen in Chapter 7, participants in degree programs (which represent a substantial investment for students and consequently yield large potential returns) were much more likely to drop out compared to participants in shorter certificate programs. It is conceivable that intensive staff-assisted counseling followed by career preparation and job placement might help students who enroll in longer programs stay enrolled.

***Stronger connections with employers could help students with job placement.*** While colleges generally focused a substantial portion of their efforts on job placement activities, many students said that they expected them to play a larger role in this area. Their expectation was based on the assumption that the employers had already communicated their needs and requirements and that they had been built into the training process. Generally, however, no AMMQC college created this type of preferential arrangement with employers. This suggests that another, deeper level of employer engagement may be



possible in which completers of specific training programs at community colleges can bypass initial steps in the hiring process and participate only in the final stages of the selection process. This could potentially result in substantial cost savings to employers due to reduced time spent on recruiting, but it would also involve a substantial level of coordination and trust between colleges and employers.

### *Pathway Development*

***Creating and aligning training programs along pathways is difficult.*** Pathway development that involved developing curricula, obtaining approvals, and hiring instructors was difficult for all AMMQC colleges, and it appeared to be one of the most difficult components to implement within the limited timeframe of the grant. This was in part due to lengthy approval processes for credit programs and the institutional silos between noncredit and credit programs. BPCC managed to make more progress on credit program development because it had a previous grant under which it started that work, and AMMQC allowed the team to finish curriculum development as part of a larger strategy to expand manufacturing programs. MWCC also made substantial enhancements to its programs to mold them more into a pathways model with sequential steps, which was again the result of several consecutive grant-funded initiatives rather than just AMMQC. This suggests that the closer the alignment between grant activities and institutional-level plans in which the college is already invested, the more progress will be made on pathways development.

***Willingness to experiment facilitates the development of pathways.*** Despite these challenges, all AMMQC colleges succeeded in making some progress towards pathways development with programs (especially credit programs) that were “stacked” and “latticed,” both with one another and with other programs at the college, thus encouraging the formation of career pathways. However, the extent of “stackability” varied considerably among colleges. Overall, MWCC achieved the most progress in this regard, having developed two distinct pathways that also included noncredit programs. This progress can be attributed to the grant team’s adoption of a career pathways approach where development of programs was seen holistically, and where there was a willingness to continually experiment by adding new programs and redesigning pathways.

***Using prior learning assessments can facilitate pathways advancement.*** NCSC partnered with the Council for Adult Experiential Learning to develop an online Prior Learning Assessment (PLA) tool for the college’s advising programs, called the PLA Accelerator. This tool appeared likely to be incorporated into the college’s general advising structure, which may ultimately enable more students with existing skills and experience to move through the college’s training programs faster and improve completion rates.

***Promoting employment and advancing through career pathways may be difficult to reconcile.*** Based on the available administrative data from colleges, no grant participants other than those from MWCC completed an AMMQC-funded program and subsequently enrolled in another. These difficulties partially reflect tensions often found in career pathways development, especially for hard-to-serve populations that typically enroll in noncredit programs. For these populations, finding employment and advancing through career pathways are often at odds, despite the expectation that career pathways can accommodate working individuals. A lesson learned is that career pathways development is not a linear process, and some components are faster to build than others. In time, however, and despite the difficulties, hard-to-serve populations must be served by career pathways approaches, and future attempts to build bridges could be more effective.

### *Technology-Enabled Learning*

***The greatest technology-related impacts of the grant came in the form of upgraded equipment.*** These equipment purchases allowed colleges to incorporate more hands-on learning into coursework; train

students on equipment that employers at the forefront of the industry were also using; and convey to students, employers, and the wider community a sense that manufacturing can be high-tech, clean, and cutting-edge.

***Greater access to instructional equipment for noncredit students could promote advancing to credit education.*** Although all the colleges purchased new equipment as part of AMMQC, in every college except for MWCC the noncredit students unfortunately did not have as much access to using and learning on the new equipment as the credit students. The noncredit students at MWCC who were exposed to the equipment reported a boost in self-confidence, such as the sense of amazement that they could, in their words, “build a robot.”

***Online simulation software holds promise for improving access and enhancing hands-on skills.***

Although the consortium made less progress in terms of converting manufacturing programs to hybrid or online models of instruction (which was initially one of the aims of the TAACCCT grant), BPCC made substantial progress in developing an online simulation game that was meant to introduce students to problem solving with programmable logic controllers (PLCs). The software was still in relatively early stages of development by the end of the grant and had not yet been integrated across the consortium schools. Nevertheless, it showed promise in terms of motivating students who like video games to learn about careers in manufacturing, and it enabled students to practice their skills and get familiar with PLCs without having to physically attend a class. Given that educational technologies such as this are likely to expand in the future, the BPCC simulation demonstrates how they can be applied to introductory-level education in advanced manufacturing and shows promise for attracting youth into a field that struggles with a stigma that manufacturing is outdated and dirty.

## ***Employer Engagement***

The consortium colleges each strove to enhance their partnerships with employers as part of AMMQC and, as noted earlier, employers were generally receptive to this given the tight labor market that accompanied the economic recovery period during AMMQC implementation.

***Engaging industry insiders may be conducive to greater employer participation in career pathways.***

MWCC’s decision to hire an industry consultant with extensive industry experience and connections can be considered a promising practice. The industry consultant was instrumental in MWCC’s success in connecting to a wide range of employers from a variety of industries. Evidence of this success included the active participation of employers in regional board meetings and the involvement of employers in grant-sponsored career events.

***Engaging business associations can create important connections.*** Another promising practice for employer engagement was the ability of colleges to establish partnerships with regional employer associations (such as the Business Roundtable in the MWCC area). This represents a promising practice because it can generate additional exposure to industry players, especially high-ranking business executives who are typically difficult to reach. By comparison, STCC’s relationship to the regional medical device industry association saw some ebbs and flows. Because the Greater Memphis Medical Device Council (GMMDC) was an important player in the local business environment, the college nominated it as its advisory group. Without its own regional advisory board, the college had limited opportunities to communicate with its industry partners, had to wait for scheduled GMMDC meetings, and had to ask for time on the agenda. However, the college’s continued relationship with this association through the America’s Promise grant is an encouraging development.

***Partnering with state economic development agencies can boost employer participation.*** A successful practice in developing partnerships with state agencies was BPCC’s strong partnership with the

Louisiana Economic Development (LED), a state economic development agency whose mission is to attract business and investment to the state, as well as to coordinate regional economic development activities between business and state-funded services. LED operates a regional office on campus at BPCC. This close relationship yielded unique benefits for AMMQC employer engagement activities, as

employers frequently visited the campus for LED-focused events.

#### Key Promising Practices from AMMQC

- Building bridges from noncredit into credit programs into a pathways framework (AMMQC)
- PLC gaming software (BPCC)
- Prior Learning Assessment tool (NCSC)
- Serving hard-to-serve people in innovative ways (NCSC)
- Speed interviews and resume cafés
- Using partnerships with state economic development agencies (BPCC) and business roundtables (MWCC) to align programs with employer needs
- Using relationships with workforce development agencies to serve students (STCC and NCSC)

***Having a long-term vision facilitates strategic decision making.*** Finally, the experience of AMMQC colleges showed that when employers in the region were better organized—either through their own industry associations or through economic development agencies it was much easier for the grant teams to build on that to make substantive improvements to the training programs and align them with employer needs. It also appeared to coincide with greater institutional-level support for making strategic enhancements to manufacturing programs overall that were guided by a long-term vision, rather than treating AMMQC like an independent or isolated initiative.

#### Other Partnerships

***Developing networks with multiple partners appeared to facilitate grant implementation,*** especially regarding recruitment and student support services. NCSC's approach was notable

for its emphasis on establishing partnerships with many types of public agencies. This enabled it to make the IRT program accessible to populations that previously struggled to access job training programs due to various barriers such as a felony conviction, lack of transportation, or substance abuse problems. The partnerships the grant team established with workforce boards led to referrals of students to AMMQC training programs at the college. In addition, a partnership with the municipal court system to refer people to the IRT trainings was seen by the court system as a valuable service for helping justice-involved individuals learn how to reintegrate into society. STCC also had a strong partnership with a local American Job Center (AJC) through which the center referred individuals to the IRT program and graduates would be hired by local employers.

***Partnerships should be maintained over time.*** Although developing partnerships with public agencies proved a valuable strategy, many consortium colleges had difficulty maintaining relationships over time. In some cases (such as at MWCC), this appeared to be the result of staff turnover, as a grant liaison located at one local workforce development agency left the grant team and was not replaced in that role. Other times it was a result of realignments in the priorities of local agencies (such as the WIN center's decision to discontinue its relationship with STCC). More consistent staffing and having a diverse portfolio of networks might help to alleviate these difficulties.



## Data and Tracking Systems

**Increased data collection and capacity is central for building career pathways.** To achieve this goal, however, a strong data collection and sharing infrastructure must exist. The capacity of AMMQC colleges to collect and analyze academic and labor market data was relatively underdeveloped at the start of the grant. Not only were there some privacy concerns about using individual-level data, but important sources of data were not available in a systematic way. For example, AMMQC colleges did not have access to a reliable source of earnings for grant program participants, and data available on noncredit program participants at the college (which were typically stored in a different system than data on credit program participants) were very limited in scope. In addition, there was often a shortage of staff capacity to enter and record data.

**AMMQC colleges learned about the importance of high quality data.** By the end of the grant period, important challenges remained. Despite multiple attempts of all colleges, only one (NCSC) managed to obtain employment and data from its state unemployment agency. In addition, colleges still had difficulty in tracking students' movement through multiple programs. However, they began to see the advantages of having a good data infrastructure. Thus, despite initial reticence toward using a software platform to track grant program participants, by the end of the grant all colleges were using the same software for this purpose (although the data could not be shared between colleges). This software application was designed such that it could calculate performance metrics required by USDOL automatically.

## Conclusion

Overall, the experience of AMMQC suggests that the consortium achieved its mission to begin the design of institution-wide, systems-level changes that functioning career pathways approaches may require in practice. The evidence also suggests, however, that this should be viewed as only the first step in the right direction, and that the three-year duration of the grant may have been unrealistic for enacting the types of lasting changes required.

Our evaluation of AMMQC suggests that career pathways programs funded through the grant held significant potential to transform the educational and labor market landscape of the participating regions. Students appreciated the potential of the programs to lead them to successful careers, particularly if plenty of support existed to smooth difficulties and facilitate transitions between programs. Employers appreciated the quality of the programs and the availability of a qualified workforce. However, there is still much more progress to be made. Key barriers still exist, including:

- Political and institutional barriers to bridging noncredit and credit programs;
- Lack of online learning options and limited use of modified course formats that would be quicker for nontraditional students to complete;
- Inconsistent availability of student support services, especially between noncredit and credit program participants;
- Inconsistent staffing;
- Insufficient time to gauge results of credit program enhancements within the grant period; and
- Lack of tracking systems.

These remaining difficulties suggest that career pathways development is a complex endeavor that requires considerable time to complete, and then requires constant adjustment and monitoring. Furthermore, TAACCCT was enacted during a difficult period when higher education experienced

significant cuts in funding<sup>49</sup> and when funding for the public workforce development system declined dramatically as well. Against this backdrop of secular funding decline, and given the impending need to respond to the manufacturing skills gaps mentioned in Chapter 1, TAACCCT was a welcome respite insofar as it allowed some limited systems building. However, given the newness of career pathways development and the size of the task, much more ongoing (and stable) investment is needed so that the systems begun under TAACCCT continue to develop and flourish. Subsequent grant programs such as America's Promise and TechHire will allow some of this to take place. However, there is a need to think structurally about this problem, and this can only happen with sustained investment over a relatively long period of time.

The potential benefits from successful career pathways development in advanced manufacturing are considerable. As stated in Chapter 1, to remain globally competitive, the U.S. manufacturing sector is moving toward automated production systems for which many middle-skill jobs exist or will be created. However, there are currently not enough individuals who can fill these jobs, because a) potential job candidates do not have the required skills, and many have several barriers to employment that cannot be easily addressed; b) many individuals who currently work in these positions are retiring (or will be retiring in the next decade); and c) companies are often reluctant to invest in training because they are afraid that competitors will poach their employees (otherwise known as the "free rider problem"). Successful career pathways systems can alleviate these labor market imbalances, but in the absence of a concerted policy to support and sustain these initiatives, the potential of career pathways will be lost.

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<sup>49</sup> Mitchell, Leachman, & Masterson (2017).

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## APPENDIX A: JOB TRAINING UNDER AMMQC: STUDENT PERSPECTIVES

This white paper analyzes student perspectives on career pathways initiatives at community colleges within the Advanced Manufacturing, Mechatronics, and Quality Consortium (AMMQC), funded by a Round Three Trade Adjustment Assistance Community College Career Training (TAACCCT) grant from the U.S. Department of Labor (USDOL). The purpose of the AMMQC grant was to transform educational delivery methods and accelerate credential attainment in the advanced manufacturing fields of mechatronics, metrology, and quality assurance/control. The AMMQC consortium included four community colleges: Mount Wachusett Community College (MWCC) in Massachusetts (the consortium lead); Bossier Parish Community College (BPCC) in Louisiana; North Central State College (NCSC) in Ohio; and Southwest Tennessee Community College (STCC).

As part of the evaluation of AMMQC, Social Policy Research Associates (SPR) completed annual site visits to each of the consortium colleges, during which we conducted student focus groups to collect qualitative data from participants regarding their academic experience, staff supports, and the overall effectiveness of program implementation. Over three years, we met with a total of 30 students:

- At BPCC: 9 students, Years 1, 2, and 3
- At MWCC: 6 students, Years 2 and 3
- At NCSC: 7 students, Years 1 and 3
- At STCC: 8 students, Years 1, 2, and 3

Student focus group participants were recruited by the colleges, and focus groups were conducted in person on school campuses (without the presence of college staff). As such, the data should be interpreted with some caution regarding how representative the students' feedback is—especially positive feedback, because the students may have been selected for perceived positive experiences by the college. Despite this risk, we found that the participants were very candid, appeared to be even-handed with their feedback on their programs, and were not hesitant to share their criticisms or recommendations for improvement.

These focus groups explored perceived individual and community value as well as the personal impact the programs had on future individual educational or vocational goals. This white paper summarizes the key themes that emerged from this research with students, highlights some case studies of specific students (using pseudonyms), and concludes with a set of recommendations for enhancing career pathways training in manufacturing based on the student feedback.

### *Student Demographics and Characteristics*

SPR site visitors conducted student focus groups at multiple stages of grant implementation and, as such, we observed variation in student characteristics over time. For example, in the first year at STCC, we spoke with students who had been hired by a local employer, Electrolux, through a partnership with the college, but that partnership weakened over time and was no longer active during later visits. In another example at NCSC, student referrals from TAA had declined to such an extent that the program looked to other community partnerships, such as local churches and the court system, to recruit qualified students. As a result, the demographics of the students who participated in the focus groups changed between the Year 1 and Year 3 site visits.

While we did not collect extensive demographic data on the AMMQC program population, focus group participants exhibited a wide range of characteristics that reflect the diversity of the student population in manufacturing retraining programs. Generally, the students had the following demographic characteristics:

- They ranged in age from late teens to early 60s.
- They came from various racial and ethnic backgrounds including African-American, Latino, and white.
- Reflecting the gender composition in manufacturing fields, they were predominantly male. Only 17% (5) of our 30 focus group participants were female.
- They were single and married; some were parents, including single parents.
- They included veterans, individuals with disabilities, individuals with barriers to employment such as criminal records and English as a second language, and immigrants.

Educationally, less than half of participants had done some academic work beyond high school up to and including bachelor's degrees. Consistent with the intention of the TAACCCT grants from the US DOL, many participants were adult learners (non-traditional students) and had extensive work histories both inside and outside the manufacturing industry. Nearly half held jobs while also attending classes. More narrowly, we also observed that:

- At BPCC, all participants were enrolled in credit programs only, and one-third (3 of 9) were veterans;
- At MWCC, five of the six participants were working while also attending school;
- At NCSC, at least two (possibly three) were living with friends or family due to financial hardship;

As we discuss in greater detail in later sections, adult and non-traditional learners often need to balance work and school schedules and may experience additional barriers to success in traditional college settings. These barriers may include additional support services such as child care, drug treatment, health care, family counseling, and transportation.<sup>50</sup> Participants from our focus groups specifically cited the following barriers to program engagement:

- Access to reliable transportation
- Financial hardship, including cost of education and certification exams
- Access to reliable child care
- Access to stable housing

*If I had a car I could just come on out there whenever the class is. [The instructor] was telling me how many [work] stations they have. You [can work your] way around the whole [set-up] in the electronic part. So, it's like you can do it if you just put your mind to it, and keep on coming. You can get your certificate. I was thinking about doing that, but right now I don't have...transportation.*

*I'm a single mom. I have four children and when they approached me about taking this program I'm like, "I can't afford to do that." One of the gentlemen that I talked to about this program was like, "Well what if I told you about this program and what if I told you the cost was free?" And I'm like, hmm. It just made it so that I could attend.*

-Noncredit student

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<sup>50</sup> Alssid et al. (2002).



*If it wasn't for my husband I would've been evicted—my lights would have been out and everything. When you ain't got no income coming in, and you sacrifice a job to [go to school and] get a better job, and this is what you got to go through to get this job is to go to four or six weeks' worth of class, I sacrifice that. No checks.*

*-Noncredit student*

## **Program Impact**

Many of the activities conducted through the grant, such as short-term certification programs, academic support services, and even career coaching, are not significantly different from the services historically available through the community college system. However, many community colleges have struggled with declining funding, budget cuts, and low enrollment over the last 15 years, and as such their capacity to provide one-on-one services for students has decreased over time.<sup>51</sup> In fact, the presence of career services staff at some community colleges is very limited or nonexistent. Moreover, a growing literature on career pathways suggests that the existing community college system was designed for traditional students coming out of high school rather than adult learners who have a variety of special needs and personal responsibilities.<sup>52</sup> With this context in mind, bridging the school-to-work pipeline can be quite a difficult challenge. The TAACCCT grants, including AMMQC, were intended to address some of these systems-level career pathways components.<sup>53</sup>

Over the three-year implementation, the students in the focus groups reported several anticipated and unanticipated positive qualitative impacts of the training on their lives and career paths. Specifically, students reported that AMMQC allowed their colleges to provide:

- High quality training in a field of study where local industry is lacking well-trained employees;
- Responsive student support services that, in general, met or exceeded the needs of enrolled students to successfully complete the programs; and
- Up-to-date manufacturing equipment to supplement student learning that, in general, mirrored the equipment in use in the workforce.

We also heard overwhelming feedback regarding a sense of cohesion that developed between student cohorts, as well as notable improvements to students' sense of capability and professional worth.

*I didn't know anything about any of that. Then I built a robot....I'm like, "Look at me. Look at me. I built a robot," and like I said, where are you going to get this opportunity to get interviewed by...manufacturers? You know...manufacturers with good benefits, where are you going to get that at? And get to sit down with all those people and put on a show and let them know what you're capable of doing? It's a blessing.*

*-Credit student*

*I was able to get the credential, which you know, was appropriate for the amount of training.... It was because of this grant that [I] graduated, and I got that lifelong credential now. Whether anyone cares or not, I care. I think it's kind of cool, because I can sign my name and put the letters afterwards.*

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<sup>51</sup> Bailey (2015).

<sup>52</sup> Fein (2012).

<sup>53</sup> Manhattan (2015).

-Credit student

While these accomplishments are laudable, other program outcomes were more varied across region and time. For example, students were usually able to receive credit for past education and work experience. However, we did hear about instances where credit transfer failed for students with international work experience or education. Not all colleges were able to set up articulation agreements with four-year institutions in the area or, if they did, staff did not know about them.

*They say, "it may"—they don't guarantee it. They say [course credit] MAY not be transferred. That is the word they use.*

-Credit student

The value of the various credentials earned through the program differed depending on the audience. In general, students valued the certificates highly and felt they would open employment opportunities. They reported that employers tended to have a more mixed response to their credentials. Some said that employers didn't really care about a candidate's industry-recognized certificate, while other employers did not recognize the certificates when approached about a job.

*When you go out into the field, half of the credentials we were getting, the [National Career Readiness Certificate], for the gold, silver, platinum evaluation—nobody knows it here. You know, you tell them—I personally got gold. You tell them that and they go, "Well, what's that?" .... [MSSC's CPT], that's another credential we get here, too, and still they didn't know it.*

-Credit student

Likewise, access to jobs and hiring managers varied significantly. At several colleges, placement and interview arrangements that were in place during the first year disappeared during later years and had not necessarily been replaced.

*Most of the companies that set up and schedule, they keep cancelling and they don't end up showing up. And [when they do show up] they down-talk their company. We really want some companies that come in, and HR people...who presents the company to be more positive, more excited about who they work for, and really sell out the company, and give us more information.*

-Credit student

*We never came into any contact with any [employers]. Yeah, it would be very nice for somebody to come and visit and tell us basically what the job expects.*

-Credit student

The variability in student experience over the years indicates that these arrangements are built on personal relationships that can break down when college or employer turnover occurs. Staff turnover is not always controllable, but when such instances occurred, potential pipelines to jobs and internships also seemed to falter.

In addition, the types of jobs that students could get after the program did not always meet their expectations in terms of pay or job security. For example, students coming out of the shorter readiness training programs said that the wages were very low. Others found only temporary jobs or internships,

and as a result they could not make the transition to positions in manufacturing because they did not feel it was secure enough.

*We want to be productive, but we also want stability in our jobs when we do make these changes because the majority of us are mid-40s and above that are making these changes.*

-Credit student

Many students who enrolled in short-term, noncredit programs wished to progress into longer-term credit programs, but various barriers prevented them from enrolling. As we described above, a primary limitation was financial. In some cases, students did not have enough savings to scale back their working hours. In more extreme cases, students could not afford the tuition or associated costs to attend, even while working. Other barriers preventing enrollment into credit programs included transportation restrictions, unstable housing, and family obligations such as childcare.

### STUDENT HIGHLIGHTS

*Student: Jessica*

*Pursuing: A.S. in Mechanical Engineering Tech*

*Jessica is an African-American mother of two who works full time. She described her daily class schedule as lasting from 8:00 a.m. to 12:00 noon, then she works from 3:30 p.m. until 12:00 midnight. She enrolled in IRT after hearing an ad on the radio about the program touting the opportunity to land a job for higher pay after completion. Once enrolled, however, she learned that the actual pay being offered was lower than her current wage. Even though her current company had a dysfunctional working environment, she could not afford to make the switch. With help from school staff to find financial aid, she elected to continue her education into credit programs at the school, which she hoped would lead to future opportunities.*

*"I'm a single mom. If I would have quit my job because I'm thinking that I could get a better job, then it would have left me hanging on a thread. I mean, not saying that it was a bad decision, because we all have to make executive decisions, [but this program did not] lead to a job. But it led us to get ready for what's coming."*

*There was people...in my class that has financial struggles that made sacrifices. I often thought... "Wow, it would really be good if this program could give some type of stipend."*

-Noncredit student

*My biggest issue is trying to sponsor these classes. As of right now it's difficult for me to pay for some of my classes out of pocket.*

-Credit student

*I live in [a neighboring county], and it takes about 40 minutes [to get to class], give or take a little bit. I don't drive myself, so I rely on rides. I think [my driver] only knows two speeds: slow and stop. But it's faster than a walk, faster than what I walk.*

*-Noncredit student*

If staffing was stable, however, the available support services allowed students to overcome barriers to additional education and employment opportunities.

*We are trying to see if there is some way that I can apply for either another grant or some type of funding to get me through until the spring or the fall of next year. [The intake specialist is] having me apply for this and talk to this person and following up with me. She's been like my BFF...She's becoming a real good friend and a real source of help for me.*

*-Credit student*

### **Connecting, Learning, and Persisting**

Prior to the grant, the consortium recognized through gap analyses that short-term, entry-level job readiness programs tailored to manufacturing settings were insufficiently available or inaccessible to TAA-eligible workers. Colleges set out to develop short-term noncredit programs (such as Industrial Readiness Training [IRT]), which typically lasted two to six weeks, and which incorporated certifications such as OSHA 10 or National Career Readiness (NCRC). In addition, colleges enhanced their for-credit program offerings by adding new equipment, developing new curricula, and aligning curricula with industry-recognized credentials.

Pursuing a career pathways model, the colleges identified a need to make it easier for students to move between noncredit and for-credit programs at their institutions, which they found could be facilitated by aligning the noncredit programs with industry-recognized credentials. Stacked and latticed courses would culminate in additional certifications such as MSSC's Certified Production Technician (CPT), a foundational series of certifications in several aspects of basic production processes. The consortium also recognized that career navigation and job placement supports would be needed to connect students to employers at various program exit points, and formed support staff such as career coaches, business liaisons, and job developers. Overwhelmingly, participants found much to praise about the programs themselves and the supports they received while enrolled.

### **Finding the Program**

Colleges recruited students through a variety of strategies, from referral through community partnership programs such as AJCs (which included referral of TAA candidates) and Veterans Administration offices, to proactive outreach to high schools, college fairs, and career fairs, to passive marketing campaigns both on and off campus (such as posted fliers and college webpages). NCSC undertook an innovative approach by partnering with social support systems like churches and the courts. Among the most effective were active marketing campaigns on the radio and guest appearances on local televised news programs.

While many participants reported reasonable cohort sizes, in a few instances where classes were nearly cancelled due to low enrollment, students cited the need to focus more heavily on recruitment.

*I was working toward the mechatronics certificate, okay, and [there] was a course I needed. I signed up for it in April, and all of the sudden they were not going to offer it*

*because enough people didn't sign up for it....The course [eventually] did run, they had two other people come in, so there were five of us.*

*-Credit student*

*I don't think [the program is] being advertised or they're reaching, you know, the public as much as it should. If it were, people would be coming. There are a lot of people out there who want to do it, but they just don't know of it.*

*-Credit student*

Regional project managers reported that the greatest increase in recruitment figures came when colleges partnered with employers who wished to provide additional training to incumbent employees or incoming candidates (or, more realistically, staffing agencies, which encourage their clients to participate as a means to improve their chances of landing a position with a local employer). During Year 1 at STCC—and in later years at other colleges—students were directed to the program through these partnerships, which often saw employers directly or indirectly cover the costs of training. However, focus group participants were rarely engaged with staffing agencies.

Students also found the program through more traditional routes, such as college admissions offices and word of mouth. At BPCC, for instance, where intermediate and advanced semester, one-year, and two-year credit programs were operating before any noncredit entry-level programs were implemented, students typically accessed programs through more traditional points of contact, such as high school or college counseling offices and self-referrals.

## **Academic Experience**

Overall, students found courses academically rigorous—both challenging and inspiring. Noncredit focus group participants spoke about working longer than required hours to build subject mastery. As one noted, “It push[es] you....A lot of us have more than [the minimum required] hours.” Another said, “[The program] made me feel like I’m a professional, like I’m smarter, like I know what I’m doing.” Where students struggled with specific concepts, instructors took time to provide extra tutoring and mentorship, and participants across all colleges praised the faculty.

*Every instructor in this program has real manufacturing experience. So, they can relate that to us— “Here’s what the book says, but here’s what reality is, here’s how it really happens, okay?” So that’s a plus. We’re getting that real life component.*

*-Credit student*

*They all offer to stay [late to help out with academics]. I did talk to one [instructor] back here on decimal equivalents real quick one day. I mean, he didn't mind a bit to stay and talk to me. They've actually all pretty much offered, "Hey, if you need anything, just stay."*

*-Noncredit student*

We did hear occasional disappointment with instruction when hands-on opportunities and competency checks were not conducted during class:

*My first eight weeks was with [one instructor], and then my second eight weeks was with another instructor. As far as hands-on-wise, there was a lot more hands-on in the first half. My second instructor, we didn't really do too much.*

-Credit student

Participants occasionally had varied opinions about the pacing of academic content: It was sometimes too fast, sometimes slow. Overall, however, the course content was perceived as well aligned to the skills needed for the job. One student commented, “We spent way too much time on electrical...[and] measurements; I think measurements was worse than electrical. We spent way too much time on that.” But a second disagreed:

*I think measurements and electrical are the most important part of the program....Because I've applied to nine jobs so far, and most of them require electrical experience and knowledge, and measurement experience and knowledge. I actually had to take a test for one job I applied for, and the whole test was about precision measurements.*

-Credit student

The novelty and rigor of the courses forged strong bonds between students—a theme across all four colleges and throughout all three years of the grant.

*I think there is something special with this program. I think it's the whole moral support of each other working together as a team.*

-Credit student

*We developed...an esprit de corps amongst ourselves, we were a great team....We were all friends. It was a great experience and that's something I totally wasn't expecting.*

-Credit student

*None of us knew each other when we started, and now that kind of helps how you can get along with possibly fellow coworkers. It's actually been a good experience.*

-Credit student

*We bonded more from being just average people to basically a small knit family in a short time. We grew to work as a team. We learned from the survival skills. We learned from the survival. We learned to communicate.*

-Noncredit student

It did take time for colleges to get new and updated equipment in place, and early cohorts reported a lack of access to equipment. However, meetings with students during later visits lauded the integration of updated equipment into courses and learning labs.

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### STUDENT HIGHLIGHTS

Student: Chris

Pursuing: A.A. in Modern Tool and Dye

*Chris is a first-year college student who worked in a machine shop during high school. He is planning to complete his associate of arts degree and then transfer into a four-year university. He came to the college based on advice from his high school teacher and because he learned from coworkers that the program would speed up his progression through college and help him land a good job in the local workforce. Chris praised the instruction and equipment available through the program, noting that students each had a welder to themselves and were given at least two to three hours during each class to work with it.*

*“We have brand new equipment down in welding. So, our equipment is really good [and] our teacher is very hands on.”*

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Each college developed its own variation on the noncredit IRT program originally developed at STCC. Early on, the model at STCC received strong positive feedback, with participants noting that the lessons would not only benefit their professional life, but their personal lives also.

*“It [wasn’t just] focused on... ‘This is how you conduct yourself on a job.’ These [were] ongoing skills that we could use in life, in family in home, on jobs.”*

*It’s a life changing experience as far as putting yourself out there and selling yourself. With those skills that IRT’s teaching people, I think their life, and their challenges of life [will improve].*

-Noncredit student

Other colleges modified IRT and other noncredit programs to best serve the local community. For example, to reach students who could not regularly travel to campus, some hosted IRT programs off campus in more centralized community settings. The trade-off was that these cohorts had some limited access to equipment and informal program supports, such as access to other faculty and college culture.

### Managing Academics and Finances

During the focus groups, we met with many considered non-traditional by National Center for Education Statistics (NCES) definitions: students with dependents; students working full time while enrolled; students lacking a high school diploma; or students who enrolled in college several years after high school. For many of the students we spoke with, enrollment in college programs and continued attendance were wholly dependent on their ability to cover the costs of attending.

*It’s a great opportunity if you can [afford it], but everybody’s story is different. His life, he got a wife that’s taking care of him. I’m blessed to have a husband that helps me, but what about the people [who] don’t?*

-Noncredit student

*I decided to do this about a year before I quit my job, so I saved up to survive through it. Also, I do automotive side work for supplemental income right now. Definitely ready to start working.*

-Credit student

*There's some that would like to at least get a better job, or being able to get a job sooner before graduation. So that's kind of an issue. That's where I'm at. I mean, [I'm enrolled in] the 16-week [program] and I'm out searching for a job right now.*

-Credit student

*Getting in here and getting their work done is the big thing. You have to make time for school. I work first shift, so I'm here about 3:30 in the afternoon until the lab is closed. It only gives me a few hours to do my training and hands-on stuff*

-Credit student

For students with these conditions, the support staff became an invaluable resource for navigating barriers to attendance. As one student noted, "The people they have here are really good. I mean, if you have any kind of question, they will make time for you."

## Support Staff

Participants regularly praised the support staff available through the program. Whether a student matriculated from high school or was an individual with decades of work experience, we heard resounding appreciation for services such as academic and financial counseling as well as assistance with resume development, practice interviews, and career coaching.

*There are plenty of resources at our disposal if we wanted. If you really wanted to go set up a resume, I could probably walk out of [here, and] within five minutes set up a time to sit down one-on-one with someone who's going to walk me through it.*

-Credit student

*He did everything. He helped me with the registration. He helped me with the math. He helped me with the reading and location—how to understand it, how to pinpoint certain words. He did it all. Without that I wouldn't have made it...I was having a problem with my finances. I talked to [the guidance counselor] about that. He hooked me up with some people [who were] able to help me with my finances. Not for just putting money in my pocket, but to give me a job opportunity.*

-Noncredit student

At BPCC, support staff established a resume café in which students had the opportunity to have their resume and interview presentation critiqued by multiple staff and even partner employers. Students who participated were invited to take part in speed interviews, where eight to 10 regional employers would conduct two- to three-minute pre-employment interviews. Students raved about the opportunity to get a first look by employers and consider possible employers they might apply to following program completion. As one student pointed out, "Where are you going to go and get eight interviews with eight



very well-known companies in the local area at one time? So, I feel very blessed I got the opportunity.” This practice was adopted by MWCC, where it was met with similar praise.

When support staff services failed, students typically perceived a systemic breakdown, rather than personnel failures.

*I think they should probably have somebody here that—whose job it is just to tell students what scholarships are available, and that be just their job....They could focus on it rather than having to do 200 other things, because it helps the students.*

-Credit student

*Giving the [job developers] a little bit more information of what's in the program, what we're actually learning about so they could sell that to the other companies. That's a big thing....If she kind of had an outline of what we're actually learning in the program, I think more companies will jump in on an opportunity like this. I think that we'll have more people connecting with the job then.*

-Credit student

And while every college experienced issues of turnover, challenges were compounded at colleges where programs were siloed from existing credit programs or communication gaps existed between credit and noncredit staff and faculty. For example, at one college where several staff had unexpectedly departed, students had difficulty finding out whether the courses they were taking could lattice into credit programs at the college or yield transferable credits.

*[Students] entering this program should have an orientation [session] to let them know that, you know, these are the courses you're taking and these are not transferable courses. I didn't know my Tech App class was a certificate class until [an instructor] told me. I was like, "That's something new." This should be an awareness.*

-Credit student

Finally, some of the students in the focus groups were educated outside the United States, and they expressed some frustrations about how long it has taken them to get through training at the college. Brandon's case (below) highlights how this can slow down a student's progress to complete a degree.

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### STUDENT HIGHLIGHTS

*Student: Brandon*

*Pursuing: A.S. in Mechanical Engineering*

*Brandon is a recent immigrant to the United States. He has a two-year degree from his home country in engineering, but has struggled to find work. When he immigrated he decided to further his education to become an engineer. Unfortunately, he learned that because of the differences in education systems, he needed to repeat courses he had already completed, adding both time and unexpected costs to his education.*

*"I have a good background in mathematics theories. Most of the mathematics I'm doing, I did that in my country. [But when I asked about testing out], they didn't allow me. I do not know why."*

*While pursuing his degree, he is also working full time to make ends meet.*

*"My work schedule is 12-hour PD that you're supposed to work, so [it's] difficult—5:00 to 5:00. [And then class runs from] 6:00 to about 10:00."*

*Brandon hopes to ultimately complete all the requisite courses to receive his associate of science degree and then transfer to a four-year university. He has found that college advisors are not clear about what articulation agreements may exist with local institutions, revealing a potential pathways gap.*

*"I know that my costs [may not] be transferred to [a local four-year university], so I don't know which university I'm going to go [to] after I finish this degree....I don't want to take the same course again and again, wasting time."*

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## Job Search and Placement Assistance

From the outset of the AMMQC grant, all colleges recognized the need for clearly defined career pathways, acknowledging that virtually no career navigation and job placement supports existed for noncredit students. (In fact, at most community colleges in the United States, job placement assistance is fairly limited in scope, even for credit students.) Consortium colleges attempted to close the college-to-employment gap through a variety of strategies, including:

- Developing employer relationships through regular communication and events;
- Obtaining employer feedback on curricula through academic advisory boards;

- Establishing career fairs and “introduction events,” such as the resume café, where employers could meet students without the expectation to hire;
- Providing students with job leads and forwarding resumes of candidates; and
- Offering modified or customized IRT training and supervisory training directly to employers.

## Connecting with Employers

Whether the college had existing relationships or the partnerships were newly forged and developing through the strategies mentioned above, focus group participants largely praised the efforts made by their colleges, particularly when given the opportunity to connect face-to-face through speed interviews, internships, and tours.

*We were walking out of class after the café resume, and [the career coach] said, “[the employer] loved your resume, to let you know.” I’m like, “Oh, okay.” She [the career coach] is always there, coming by and checking on us, and then trying to encourage, which to me it’s just motivating. It makes me glad I’m here.*

-Noncredit student

*When you can speed interview with a bunch of employers and all of you have the same education, they know what they’re going there with. These employers are in the room saying, “These are what these people passed with and have. These are the job offerings we’re going to have, and we’re going to interview you on the spot.” Those are so neat. You can get hired right there on the spot.*

-Credit student

On the whole, students were aspirational about their futures, and even though not all students were actively job hunting while enrolled, the involvement of employers at various levels and encouragement from faculty and staff gave confidence to students that they would get a foot in the door of an employer afterwards.

*When you have all these [certifications], a lot of companies will make room for you because you [understand] what’s going on with [...] the terminology, whether it’s in the safety aspect or administration and HR.*

-Credit student

*They let us know ahead of time that there’s going to be people here representing [various employers], and there’s always fliers around here, letting you know when they have people come in. And in the beginning of the program, we actually had reps from different companies come in and say, “This is what we do and this is how it ties into the program that you’re in.” Even if they’re not looking for anybody or hiring, they’re saying, “You are learning the kinds of skills that it takes to work in this kind of industry.”*

-Credit student

*I really do feel like this will set us up for success. [The training] would always follow us wherever we’d go and help us land a job somewhere, and be able to [excel] in that job, and promote within the company.*

-Credit student

Despite the praise from students, during site visits and surveys we heard from employers that they were not always familiar with the program, and, similarly, the value of corresponding certifications was also unknown. This was particularly apparent for employers seeking to hire for entry-level positions. The feedback from student focus groups was consistent: Students who had highlighted their training on resumes or in interviews discovered that they didn't necessarily have an advantage over other candidates.

*We had to take that ACT work visa assessment, a lot of work. I don't think that means a...thing to anyone around here; I don't think they understand it at all. You still go for employment in a job around here and they give you a fifth-grade-level math test to take. That [ACT] test was intense. We spent six weeks working on it to take that certification test, and I'm convinced it means nothing to people around here.*

-Noncredit student

## The Role of Staffing Agencies

Successful pipeline partnerships are built over time, and, as one job developer pointed out, require constant tending: “[You] have to remain visible with them. That's very important.” Over time, individual employer engagement occasionally receded, and new employer relationships needed to be forged. Where engagement broke down—either from employer or college staffing changes, hiring freezes, and regional economic slumps—employers often directed hiring through staffing agencies, which were not restrained by the grant timeline and were solely answerable to the employer rather than the college. This created systemic barriers that were felt by the students.

*A lot of these companies are using the temp agencies and keeping us pretty much locked in, you know, as temps for far too long with these skills—far too long. And it's a battle to try to get them to hire you. [We're] cheap labor and easily replaceable.*

-Credit student

*We ought to be able to get right in there and talk to HR people and not have to go through [a staffing agency]. It's to [the employer's] advantage to freeze us in their system to keep our wages low, and if you don't like it, well there's somebody else waiting. You know, we ought to have better than that based on this kind of training.*

-Credit student

Other students shared similar sentiments, supporting the need for direct opportunities to connect with hiring managers rather than third-party recruiters, who are not always accurate judges of a candidate's value.

*It would be nice to go through this program and to get, say, [an industry recognized] certification and then have [an employer] look actively and take preference upon people that actually went through the course...rather than just [tell the students], “Good luck out there in the private sector.”*

-Credit student

Indeed, toward the latter part of the grant, we observed schools establish partnerships with staffing agencies to help with recruitment. Agencies would forward their clients to the college, and those who completed short-term readiness training, the thinking went, would be easier to place in entry-level jobs.

Based on employment data provided by the schools, this appears to have been an effective tactic to recruit students and confirm placement in employment afterwards. For entry-level jobs and short-term programs, an alliance of colleges and staffing agencies can quickly boost the qualifications of job seekers.

As a career pathways strategy however, this approach potentially places the objectives of staffing agencies and colleges in opposition to one another. Colleges have underlying needs to make courses viable by recruiting students into credit programs. For stacked pathways programs, colleges may attempt to recruit students from clients referred from staffing agencies. Conversely, the primary objective for staffing agencies is to place students into jobs. Agencies may choose to only refer clients who are unlikely to pursue continuing education opportunities, thus shielding some from alternative career options.

## Work-Based Learning Opportunities

One of the original goals of the grant was to develop more work-based learning opportunities, such as apprenticeships, internships, or job shadowing opportunities, but the consortium colleges had a difficult time getting these opportunities in place for varying reasons.

*We would like for [internships] to be incorporated. That's a big thing. Internships...would really help us out with succeeding and in a career, as well as being able to get inside some of these companies and actually tour them and see what it's about....If you all really want to see more people succeed, actually being able to get into the companies will help out this program to succeed and grow up.*

-Credit student

*Even if you started, like, some kind of an internship....Even if the program is six weeks, for example, and then maybe adding another two weeks as an internship part. It would be a very good way to introduce us to the company, and then [have a chance] to spend two days in one company, two days in another [company].*

-Noncredit student

*For me, [who is new to] manufacturing, I don't even know what the floor looks like, you know, and [what] a shop looks like. Just to have that exposure to go in and we learn a lot about, you know, the safety or whatever that you have to do, that visual part would be very helpful.*

-Noncredit student

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**STUDENT HIGHLIGHTS***Student: Stephen**Pursuing: Professional Certifications*

*Stephen is a married man who works full time and has a child with autism. He loves working with machines and, while he has a full-time job, he is hoping to find a new job where he can earn more and support his family. He recently became a Certified Administrative Assistant (CAA) for bookkeeping/accounting before learning about the certificates he could earn in the manufacturing program. He hopes that the program will enable him transfer into a better job, however he noted the internships available through the program do not help.*

*"I got to leave my job if I go to that internship. I don't know if they're going to take me [after I complete] the internship. How do I know if I'm going to be alright? With a family, I can't gamble."*

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**Looking Ahead**

The consortium largely succeeded in developing abbreviated, noncredit certificate programs that could stack into additional certification-tied courses and degree programs, and, in general, students found them instructive, valuable, and relevant. Consortium colleges still need to find ways to sustain noncredit programming, however. At all four colleges, with the end of the grant, Industrial Readiness and other noncredit programming is not expected to continue. (At least one school, BPCC, intends to continue IRT, financed under a different TAACCCT grant. Once that grant ends next year, however, the program will likely end.)

Throughout the grant term, colleges had challenges articulating noncredit and for-credit programs. Fortunately, we did see examples of students bridging this gap, as described in Deana's vignette below. In this example, a current employer (possibly inadvertently) provided an incentive with a small pay increase and favorable scheduling for completing the short-term, noncredit program.

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### STUDENT HIGHLIGHTS

*Student: Deana*

*Pursuing: Mechatronics Certificate*

*Deana is a single parent with four children. She entered the program after working temp agency jobs for several years. After landing a temporary quality control job she determined that increasing her education would lead to job stability. She enrolled in a noncredit certificate course and, soon afterwards, received a small pay increase and was moved to a more desirable day shift.*

*“I started out as an assembler, and three months into the job I started, while doing this class, they promoted me. So I mean, speaking for myself, I was able to advance my career within the company and it’s ongoing.”*

*Once she was working a day shift, she was available to pursue additional education. She has enrolled in credit courses in pursuit of a degree.*

*“I did the six week, then the two week, and then enrolled in the mechatronics [certificate program]. It’s much needed in this area, because a lot of the jobs were outsourced because of unskilled laborers....So I’m benefitting from it, and it’s great. It’s been a miracle almost. It’s been really good.”*

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Some students did find jobs after completing certain programs but, overall, colleges struggled to open pipelines into jobs, and when they did it was rarely on a large enough scale to support the number of program completers. In some instances, student cohorts were subsequently hired by employers, others were offered opportunities for internships or informational interviews, and still others were provided with career coaching sessions to review resumes and conduct practice interviews. Student expectations of job placement seemed to vary, correlating most notably with age and past work experience. For example, one student who only received career coaching through the program mentioned, “The one thing I’d like to see is more than one practice interview.”

Another student who was offered the opportunity to attend a closed career fair stated,

*They don’t even bother to look at the resume, even when you try to give it. They say, “Go online and apply.” I already knew that, but I’m coming to the career fair first and try[ing] to have that face-to-face. Usually, like, when you apply, all you’re looking for is just that one phone call to get in for the interview. Career fairs don’t give you anything.*

*-Credit student*

This gap—connecting students to jobs—is relatively new territory for community colleges.<sup>54</sup> Significant numbers of adult learners, in particular, may not be successful landing jobs without a more

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<sup>54</sup> Kozumplik (2015).

comprehensive approach to job training that takes multiple service needs into account. Based on the focus groups, it appears that one of the most challenging things for colleges to do effectively was to engage employers effectively and consistently, and as a result the pathways into decent jobs were not very clear from the students' perspectives.

*Something's got to get done to [tell the employer that the student] from this school and program is better than your entry level, okay? And I don't know how to break that ceiling....The school has been a little bit helpful, but not very helpful on that. Education-wise, top notch—but once [we're] out there, it's like nobody wants [us]....[Employers] don't know the certifications we're getting and what it means and the work involved to get it.*

-Credit student

*The majority of us that are in these classes are looking for employment, bettering ourselves with better employment, better benefits. We can get jobs...make \$450 a week, work seven days a week. That's not what I'm looking for. I'm looking for a better position.*

-Credit student

## **Takeaways and Recommendations**

Students actively participating in AMMQC grant programs shared their recommendations for improving off-ramps into jobs. When college-level job placement counselor staffing is stable and referral partnerships between schools and employers are strong, the system linkages between relevant academics and employment opportunities function more smoothly, and students can apply their education in interviews and at job sites.

*Do you know what a micrometer is? I didn't know what that was and really how to use it and what the name of it really was until I took the program.*

-Noncredit student

*I was in an interview...and I was asked three different things....They asked me what five inches was. I was able to tell them 'cause of this course. They asked me what lockout-tagout is. I was able to tell them 'cause it's in the course. They asked me about PPE. I knew a little bit about it, but sometimes you've got to know how to word it. I was able to speak to that. Nobody scripted me, nobody told me that's what they're going to ask. That's what they asked me in there. I got a call Friday [from the employer] saying that I have an assessment coming up. So that's a good look.*

-Credit student

The gap that students most frequently cited, by far, was the separation between academic training and the connection to hiring managers. Participants reported that short-term readiness training programs gave them valuable, lifelong workplace skills, but that in many cases, these programs did not improve job prospects. Participants therefore reasoned that longer-term certificate and degree programs were the best route for finding good jobs. Unfortunately, significant issues prevent enrollment and completion of these programs, such as financial expense, transportation, stable housing, and family or childcare obligations.



*If you want people to go ahead and take these programs, then maybe not giving them a full ride but certainly helping them out to get there—because I know very few people that are going to come to college just to go to college because it's free. I mean, if all you're doing is paying for my tuition and there's nothing else, I mean, I'm not getting lunch money and rent money from you. I don't know. I would rather be out there working rather than just attending school and not making money.*

-Credit student

Secondly, if staffing was stable, the student support services, such as career coaching, tutoring, and job development, were invaluable. Support personnel connected students to community resources and guided students into courses and career pathways that would have otherwise not been accessed. In most cases, these services are not ones generally available at community colleges.

Based on the feedback from focus group participants, we can outline the following recommendations for future or continuing career pathways programs:

- **Maintain student support services beyond the grant term.** Across the consortium, participants expressed high praise for the professionalism and dedication of staff. Colleges considered most student support positions temporary, since they were funded by the grant. Consequently, services such as academic counseling and job development suffered from staff turnover. Counseling, coaching, and support services are important for credit and noncredit students alike; for career pathways, a flexible model designed for students will allow them to develop professional and academic achievements over time. These supports will heavily impact the ultimate outcomes.
- **More can be done to break down institutional silos between noncredit and for-credit programs at community colleges. This requires high-level buy-in from college administrators and faculty.** The most stable pathways programs operated at colleges where a dean and/or chancellor were involved on a frequent basis and program staff had regular daily contact with college administration and faculty. Supporting staff, such as job developers, will be more effective at recruiting employers if they have daily access to college faculty and understand how training at the college directly correlates to the work environment.
- **Colleges might consider offering short-term “micro” programs lasting two to eight weeks for smaller increments of credit than typical semester courses.** Colleges have not found a way to sustain noncredit training programs outside of federal grants. One college, BPCC, made semester-long programs sustainable by offering credit, but shorter-term programs (less than 15 weeks) have not been adopted under a credit model and are expected to end without grant funding.
- **Programs will need to use consistent messaging, and program recruiters need to be aware of student expectations from the outset.** Students had differing expectations of the program. Older and displaced workers were often seeking a strong job placement component, while younger and more novice students expected programs to provide more traditional academic outcomes.
- **Involvement of temp-to-work staffing agencies should be carefully considered;** in some cases, it may undermine the aims of the career pathways model. While we're not suggesting colleges shy away from forging symbiotic relationships with staffing agencies, their role should be carefully considered and discussed with employers. Staffing agencies inherently serve as an additional screen to hiring managers, and in some cases colleges may be better served by a direct employer relationship.



## APPENDIX B: EMPLOYER PERSPECTIVES ON AMMQC

This appendix summarizes employer perspectives of the Advanced Manufacturing, Mechatronics, and Quality Consortium (AMMQC), an initiative to enhance community college training programs in advanced manufacturing and better align them with employer demand. The U.S. Department of Labor (USDOL) funded AMMQC through a Trade Adjustment Assistance Community College Career Training (TAACCCT) grant (Round 3). AMMQC aimed to create career pathways in advanced manufacturing fields of mechatronics, metrology, and quality assurance/control at four community colleges: Mount Wachusett Community College (MWCC) in Massachusetts, the consortium lead; Bossier Parish Community College (BPCC) in Louisiana; North Central State College (NCSC) in Ohio; and Southwest Tennessee Community College (STCC). As part of building regional career pathways, TAACCCT grants sought to strengthen relationships with employers by engaging employers as members of advisory committees and strategic partners to assist in developing demand-driven training aligned with employer and market needs.<sup>55</sup>

The data analyzed in this paper were collected through a series of employer focus groups that took place during annual site visits to each college during the grant period (2014-2016) and through a phone survey of employers engaged with the grant.

We begin the paper by presenting recent attempts at the federal level to stimulate employer engagement. We continue with a description of the methods used and a summary of employer characteristics. In the main part of the paper, we divide our findings into three major categories: the reasons employers collaborated with AMMQC colleges; the benefits employers experienced because of the collaboration; and recommendations made by employers for ongoing collaboration with colleges.

### Background

The most recent workforce development legislation in the U.S., the *Workforce Innovation and Opportunity Act* (WIOA), clearly articulated the need for the workforce system to be demand-driven and required local areas and regions to develop sector-specific programming and fund training programs that are aligned with in-demand occupations. Although employer engagement and demand-driven job training systems are now identified as a high priority in U.S. workforce policy, there is little research that establishes what “good” employer engagement means or that offers evidence of effective employer engagement practices.<sup>56</sup> There is growing evidence that sector-based initiatives, which tend to have relatively strong employer engagement, result in positive, statistically significant gains in employment and earnings for participants.<sup>57</sup> However, none of these studies analyzed employer engagement practices and their effectiveness specifically. Other research has highlighted promising practices in employer engagement, as well as the challenges and tensions associated with creating a more “demand-driven” employment and training system. For example, two studies have found that Chicago’s sector-based workforce centers were, in some sectors, able to shape firm hiring practices and increase entry-level wage rates among partner firms.<sup>58</sup> Overall, there is a need for much more research on employer

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<sup>55</sup> See the TAACCCT employer engagement fact sheet:

[https://taaccct.workforcegps.org/resources/2016/12/07/14/37/TAACCCT\\_Fact\\_Sheet\\_Deepening\\_Employer\\_Engagement](https://taaccct.workforcegps.org/resources/2016/12/07/14/37/TAACCCT_Fact_Sheet_Deepening_Employer_Engagement)

<sup>56</sup> DOE (2012); Barnow & Spaulding (2015).

<sup>57</sup> Maguire (2010); Smith, King, & Schroeder (2011); Lowe, Goldstein, & Donegan (2011).

<sup>58</sup> Schrock (2013); Lowe, et al. (2016).

engagement in a variety of settings and industry sectors, both from the perspective of how colleges can effectively engage employers for job placement and recruitment activities (labor market intermediation) as well as leverage those relationships to align training content with demand.

Most of the resources on employer engagement consist of applied policy guides or toolkits from the DOL's Employment and Training Administration or technical assistance or policy research firms, which largely draw from experience working with front-line staff members and managers who deliver employer services rather than in-depth research with employers or employer organizations.<sup>59</sup>

Several of the resource toolkits categorize employer engagement activities into typologies. For example, Jobs for the Future produced a resource that defined employer engagement along a continuum of five levels:<sup>60</sup>

1. **Advising**, which includes initial relationship development and may include discussing hiring needs and skills competencies.
2. **Capacity-building**, such as providing job tours and donating equipment.
3. **Co-designing**, such as curriculum development.
4. **Convening**, such as developing college-employer sectoral partnerships.
5. **Leading**, where multi-employer, multi-college partnerships develop.

Community colleges have not historically played a large role in employer engagement in the United States. As a result, employer engagement was a new activity for the AMMQC consortium colleges and required a learning process.

## *Methods*

In the final year of the grant period, the evaluation team designed and conducted a telephone survey to understand employer participation under the grant and to gather employer feedback about their experiences. Social Policy Research Associates (SPR) contacted a total of 73 employers (using lists of employers and contact information that the colleges provided), and 36 of them responded to the survey (a 49 percent response rate).

The employer survey asked questions regarding employer role and company size, activities in which they were engaged with the college, perceptions of the benefits of partnering with the college, satisfaction with hires, and satisfaction with equipment and curricula. Employers were also given an option to provide open-ended responses with suggestions for improvement in curricula, course instruction, the equipment provided to students, and job placement activities. Dissatisfied or less engaged employers may have been less likely to respond to the survey, leading to potential response bias. Therefore, the findings from the survey should be interpreted with caution.

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<sup>59</sup> One exception is: Dunham, Salzman, & Koller, 2004, which was research-based.

<sup>60</sup>JFF, 2015; Wilson (2015); Mann, 2017.

**Exhibit 1: AMMQC Employer Survey Completion, by College**

College	Valid Contacts	Completed Surveys	Response Rate
STCC	10	4	0.400
BPCC	19	10	0.526
NCSC	11	6	0.545
MWCC	33	16	0.485
<b>Total</b>	<b>73</b>	<b>36</b>	<b>0.493</b>

The evaluation team conducted focus groups with employers during annual site visits in 2014, 2015, and 2016. Regional project managers recruited employers for the focus groups. Participation ranged from one to four employers in each focus group. The focus groups provided an opportunity to gather more in-depth information from employers about what drove their motivation to engage with the college and how they valued the training programs that the college provided. SPR researchers asked employers about their company's characteristics, activities with the college, feedback on hires from AMMQC programs, satisfaction with curricula, and recommendations for how colleges could improve their relationships with employers. Employers that participated in the focus group were among the most heavily engaged of all employers in each college's network; therefore, while they offer a richer understanding of employer perceptions and motivations than the survey, their responses should not be taken to be representative of all employers that the colleges attempted to engage.

### *Employer Demographics & Characteristics*

The employers that participated in AMMQC activities varied in size, industry subsector, and type (e.g., original equipment manufacturers or second/third tier suppliers). The employers represented industries such as the medical device industry, plastics, appliances, and paper goods packaging. Their companies ranged in size from 20 to 500 employees. Sixty-nine percent of employers who responded to the survey had more than 100 employees.

### *Why Did Employers Engage with Community Colleges?*

The main reason why employers reported engaging with AMMQC had to do with their hiring needs. They often cited the need to have better-prepared employees, and they perceived participation in AMMQC activities as a means to this end. Employers said that middle-skill positions in manufacturing, even entry-level positions, typically require skills that more advanced than those required by traditional blue-collar jobs:

*Our machinists are much more than that they're able to troubleshoot. At the machinist level, [they] get into the programming and adjust programming on CNC equipment. And so, they can get involved into I'd say more than other straight machine shops that are doing mass production. And [...] our machinists have to be diverse enough and skilled enough to be able to do more than just changing tools and closing a door and pushing a button and loading a part. Similarly, on our assembly side, they don't just look at a drawing and put it together. They're more like mechanics that they need to adjust and shim*

*and reckon that there's some adjustment in a product they're building, they can't just slap it together and expect for it to work.*

*It's a lot of technical skills, a lot of computer. I mean they have to be computer literate. A lot of these machines sometimes aren't even human operated. They're operated by a computer and so you have to understand how the equipment works, but you also have to be able to understand the dynamics behind it too, to be able to operate it.*

Because of the skills required to perform well in these positions, employers reported having difficulty filling them. The difficulty of finding job candidates with these more advanced skills was perhaps the most important incentive for employers to participate in AMMQC:

*[...] it is harder to find people who are trained on things like PLC, and robotics, and things like that, so we're really trying to find our way and develop those programs internally where you have an entry level individual who maybe has an aptitude for something like that, and really work on programs to identify those individuals. Then work through those, because it doesn't exist as much in the external market.*

Together with hiring concerns, employers articulated other reasons for wanting to engage with their community college. Among these additional reasons, employers said they wanted to use their AMMQC participation to stay abreast of regional trends as well as connect with other employers:

*Being aware of some of the programs that they're working on, being able to participate, to network and meet other business, and see what their issues are, and also kind of giving individuals an opportunity who maybe hadn't had an opportunity to work in this type of position before. Those are definitely some good points from the [regional advisory] board.*

The two factors that appeared to shape the employers' level of motivation to engage with colleges to the greatest extent were the existence of previously existing collaborations between employers and the workforce system or economic development organizations and the volume and consistency of an employer's hiring needs over time. During the grant period, the economy was growing in each of the local areas for the consortium schools (see Chapter 1 of this report); therefore, the colleges likely benefited from implementing the grant at a time where demand for labor was relatively high. Nevertheless, it was generally more common for the colleges to initiate engagement with the employers than vice versa.

Small employers or companies that had temporary or episodic hiring needs appeared to be less motivated to engage consistently with their community colleges. Some of the college grant staff members found that this inconsistency in motivation undermined their efforts to make decisions about instructional equipment and course content. For example, in the first year at STCC, a local employer partnered with the college to create and deliver custom IRT trainings; however, a new staffing director changed the company's hiring focus to a temporary staffing structure, which eliminated the need to engage with the college for program graduates.

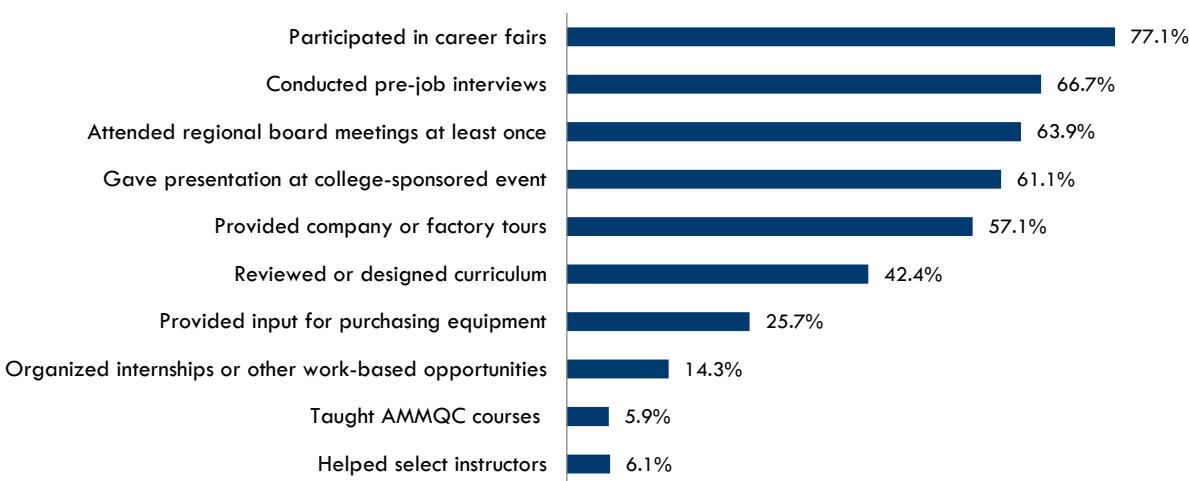
The two colleges that had more robust preexisting forums for employer-government partnership had an easier time enhancing employer engagement in grant-related activities. At BPCC, the state economic development organization had a presence on campus, and at MWCC the college was already engaged in a regional manufacturing roundtable along with other workforce and economic development partners.

## How Did Employers Engage?

AMMQC colleges conceptualized employer engagement as a means to achieve grant-related goals, including: assisting with hiring needs of students; establishing or increasing employer participation in regional grant advisory boards; getting employer input on equipment purchases; selecting industry-recognized credentials to align with courses and curriculum enhancements; setting up work-based learning opportunities; and inviting employers to job development activities, such as mock interviews, factory tours, and speaking in classes.

In practice, employers participated in all these grant-related activities, but with varying levels of intensity. Findings from the employer survey (Exhibit 2) show that they were especially involved in activities related to jobs and careers (e.g., career fairs, assistance with job search, and conducting interviews with AMMQC students). However, employers tended to be less involved in academic-oriented activities such as teaching AMMQC courses or selecting instructors.

**Exhibit 2: Employers' Involvement in AMMQC Consortium Activities**



It appears, thus, that employers tended to participate more frequently in activities that were directly connected to the main goal of their involvement in the consortium, which was addressing hiring needs and networking with other employers and regional public officials. While this emphasis is understandable, the lower involvement in academic-oriented activities appeared difficult to reconcile with the employers' stated need for job candidates with advanced skills that can be forged through training. This apparent paradox appeared to originate from the employers' limited knowledge of the community college system, which made them unsure about the skills that they could expect from completers of academic programs at the colleges. In addition, many of the skills required by companies were company specific, making it difficult to create crosswalks between training programs, certifications, and industry positions that were common among employers from a region, and that would help community colleges design adequate programming. The STCC economic region was moving toward this goal:

*[...] we have recently formed what's called the Greater Memphis Medical Device Council [GMMDC] and that council is working on developing performance standards based on NIMS [National Institute for Metalworking Skills] that we would like to be able to give to Southwest and anybody else who can produce students that can meet those standards.*

Given that GMMDC had only been created in 2014, however, such roadmaps were still being developed during the grant period.

Another activity that employers participated in less frequently was providing work-based learning activities. Only 5 survey respondents (14 percent) of employers said that their company organized internships or other work-based learning opportunities, such as job shadowing, internships, or apprenticeships. In focus groups, some employers stated that their companies did not provide these opportunities due to safety or insurance concerns. These concerns are valid in advanced manufacturing because much of the equipment on which students would train is expensive and physical injury is a real possibility. Still, work-based opportunities are expected to provide substantial benefits for students. In addition, work-based learning is essential for building the hands-on skills that employers said they needed in their employees. Therefore, finding ways to engage employers to provide this opportunity more often represents a clear opportunity for growth.

### *Employer Perceptions of the Value of Engaging with Community Colleges*

One of the possible outcomes experienced by employers was being satisfied with the consortium's operation. Exhibit 3 summarizes employer satisfaction from engaging with AMMQC colleges, as stated in the employer survey. More than half of respondents were strongly satisfied with the curriculum content offered to students, about half were very satisfied with the instructional equipment offered to students and the effectiveness of the grant team promoting program graduates. Slightly more than a third (36.4 percent) of employers felt that the regional board meetings were very productive.

**Figure 3: Employers' Satisfaction with Certain AMMQC Consortium Activities**



Another positive outcome for employers was hiring AMMQC graduates. In focus groups, several employers said that they had done so, and they commented positively on the skills of AMMQC graduates compared to a typical job candidate:

*[AMMQC] employees [...] are much further along in terms of their training than the average operator. So, the exposure they get, the broad nature of the training, the hands-on aspects, the OSHA training components of it, some other things, as well as computer skills and behavioral skills – there's a lotta really good components to the training that these folks are getting that, like I said, the average operator that works here hasn't had yet. And so, their learning curve should be accelerated in comparison to the average operator. There's so much potential.*

Employers reported deriving additional benefits from their engagement activities:

- **Engagement allowed employers to become better acquainted with the training programs offered throughout their community.** Often, employers were not aware that certain certificates



or programs were available in their community. Thus, engaging with the college helped them to network and tap into a previously unknown resource.

- **Employers appreciated first access to new potential hires.** Depending on the level of engagement, employers were given an opportunity to interact with potential job candidates earlier than other employers, such as through the resume cafés at BPCC and MWCC.

### PROMISING PRACTICE

*BPCC implemented Resume Cafés and Speed Interviews with employers that were widely successful. Resume Cafés were sessions where students would receive feedback on their resumes from several staff (and sometimes an employer), and staff would answer questions pertaining to resumes and interview preparation. Once a student attended a Resume Café, they qualified to also attend a Speed Interview. The Speed Interviews were organized like speed-dating, in which students would get to talk for several minutes with 8-10 employers, and they would rotate around the room. Resume Cafés and Speed Interviews were so successful at BPCC that MWCC replicated them, and they were similarly popular with students and employers. Multiple employers provided positive feedback in the survey regarding these events:*

*"I am favorably pleased with my involvement as HR. I love the interview cafés."*

*"I really liked the speed interviewing, which allowed us to get to know the advanced mechatronics students."*

### Challenges that Employers Face in Engaging with Colleges

Employers reported several challenges when they partnered with their community college. Several noted the amount of time required to build relationships and the difficulty of identifying whom to direct request to at the college, especially considering high staff turnover and limited resources at the college-level for employer engagement overall.

Employers from colleges with significant staff turnover in the grant team said that the change in staff made it difficult to know who to contact at the college:

*It is critical for employers to know who to contact in the college. There has been a lot of turnover and it is not clear who to talk to at times...Colleges need to strengthen their communications.*

*[...] another thing I think they need is to figure out how to maintain a focus despite the churn in staff. I'm anticipating that staff at a lot of the community colleges around here are going to continue to churn, and so how do you institutionalize it so regardless of who's in the right spot, the program will continue. So how do they develop the redundancy or the institutionalization so that it can be maintained?*

In addition, employers noted a need to advertise more widely the certificates to increase awareness among employers of the skills and abilities that students acquired through credentials and certificates.

*[...] we had a whole bunch of us in that original meeting, and none of us had ever of this Industry Readiness [certificate]. It's, like, if I saw that attached to a resume, I'd think somebody did something on Photoshop or something. So, we talked to them about making sure that's got to be part of the marketing plan; [the college has to] also get employers to understand that.*

*Still need to market the certificates. Companies I've spoken to don't know about the certificates/ credit program...Companies don't know what it is the students learned in regards to certificates or credits. Need to increase marketing.*

Lastly, a challenge experienced by employers (although not directly related to their relationship with AMMQC colleges) was the image of manufacturing jobs as being old, outdated, and dirty:

*[...] so much industry left [in] the United States is really, in the eyes of the students coming in, not a job that a lot of them even consider, and so it's very difficult to even attract high school students to even think about technical careers and manufacturing careers.*

### *Recommendations Made by Employers*

While most employers were generally very pleased with their engagement with the college, many employers provided constructive feedback and were hopeful that their relationship with the colleges would continue. The following lists recommendations from employers:

- **Continue to build upon and strengthen existing employer partnerships.** Employers generally provided encouraging feedback about their relationship with the college and wanted to see continued efforts to reach out to them. Employers felt that colleges should take time to understand what each partner seeks to obtain in the partnership to effectively direct future engagement.

*We need to have an ongoing dialogue with the industry partners and coalitions. There needs to be an ongoing outreach and communication beyond the initial development of the grants to assess employers and industry needs as they change.*

*I'm thinking of one program that they went out and they asked industry for support, "How can you help us?", and we gave them a new C&M machine, other people gave them different kinds of equipment and everything, and I think if you have not just instructors but somebody that's working the industry, and working the city, and trying to reach out and get that help, I think it would come.*

- **Increase coordination with economic development, business associations, and other existing networking and policy efforts.** Colleges who served on economic development boards, such as BPCC, had the greatest levels of employer engagement and the most satisfied employers. While this increased satisfaction may be due to many factors, such as personal relationships and the long-term nature of these relationships, these partnerships also brought added awareness to legislation and associated events to continue to develop the workforce. Coordination reduces the need for employers to go to multiple meetings to interact with the same people.

- **Advertise the training programs and credentials more effectively:** Often, employers did not understand what training or qualifications were associated with a certificate, such as the IRT certificate.
- **Ongoing communication with employers.** Colleges should maintain regular communication with employers to reassess needs and satisfaction, beyond just sending email notifications. Colleges should follow-up on previous requests that employers made to explain if they were implemented and how. When turnover exists at the program level, staff members should be transparent in terms of handing off employer engagement tasks and communicating their replacement to employers. New staff should reach out to employers to help continue the relationship.
- **Work with employers to establish more work-based learning opportunities.** Employers suggested that students were not trained or that they needed more interactive, hands-on training. However, work-based learning opportunities, such as internships, apprenticeships, and job-shadows were very limited for students. Factory/company tours are one additional way in which employers can introduce students to the work environment and demands of the job. Colleges may also consider providing paid-internships to alleviate the financial hardship on students.

### *Summary of Findings*

Most employers reported needing to fill middle-skill positions in advanced manufacturing, and having difficulty filling these types of positions. We found that while the level of engagement differed amongst employers, building strong employer-college partnerships took time and was strongest when colleges had preexisting relationships with economic development agencies and employer associations. In addition, employers reported participating in activities connected with hiring, but much less so in academic-focused activities. We also found that employers valued engaging with consortium colleges, and that they did so for a variety of reasons that included, but were not reducible to, addressing hiring needs. Finally, employers offered recommendations for future collaborations, including the need for consistent and ongoing communication, broader and more effective advertising of programs and certificates in the community.



## APPENDIX C: COMPLETER SURVEY WEIGHTING PROCEDURE

To correct potential nonresponse bias present in the data, we weighted the completer survey responses using each completer's propensity to participate in the survey. A logit model was estimated wherein participation in the survey (a dichotomous variable) was regressed on a set of participant characteristics including college, age, gender, race and ethnicity, student status, and participation in credit versus noncredit program. This logit model generated a predicted probability for each participant that represented that participant's propensity to participate in the survey. Subsequently, survey responses were weighted using the inverse of this propensity, such that the responses given by participants with a lower propensity to participate in the survey were given more importance compared to responses of participants who were more likely to participate in the survey.

Information on gender, age, and race and ethnicity received from college administrative data systems suffered from significant missing data issues (roughly ten percent of the cases). Since logit proceeds by list-wise deletion of missing values, the procedure described above would have excluded many participants by not assigning them any weights. This problem was addressed through a multiple imputation procedure (Royston, 2005). More specifically, computing weights proceeded in the following steps:

1. Variables from the logit model described above were used to simulate multiple datasets with imputed values calculated for the missing values (see Stata documentation for the `mi impute` procedure)
2. A logit model of survey participation was estimated for each simulated dataset, and a pooled predicted probability of participating in the survey was generated (see Stata documentation for the `mi estimate` procedure)
3. Survey weights were calculated as the inverse pooled propensity to participate in the survey.

(For technical details on combining inverse-probability weighting and multiple imputation, see Seaman et al., 2012.)

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