Evaluation of the Michigan Coalition for Advanced Manufacturing (M-CAM)

Mid-Project Implementation Report

Date: September 15, 2016

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Cover Photo: Brittany Schroeder, a CNC machining student at Lake Michigan, is using the lathe to face a piece of stock to length

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Acknowledgements

SPR would like to thank the college administrators, data personnel, faculty, and M-CAM staff members (identified below) who shared their observations and insights with us over the last two years. This report also benefited greatly from the input and perspectives of employers, workforce staff, and other key partners.

A special thanks to Dr. Jim Jacobs and Gerri Pavone at Macomb Community College, each of whom has provided vital support to and feedback on the evaluation effort. We also would like to especially thank the nearly 100 M-CAM students who participated in focus group and case study interviews for generously sharing their stories, voices and perspectives with our evaluation team.

Bay College: Laura Coleman, Robert Pontius, Beth Ann Belcher, Melissa VanBrocklin, Mark Highum, Dave Konkel, Jessica LaMarch, Mark Kinney, Pete Noblet, Gregory Bekes, Henry Trottier, Joel Schultz, Deb Doyle, Scott Kuhl, and Aleksandr Sergeyev.


Kellogg Community College: Dr. Dennis Bona, Dr. Jan Karazim, Levi Good, Tom Longman, Lisa Larson, Casey Fairley, Roy Took, Bob Day, Bob Griffin, Jason Moore, Tim Krueger, Randy Dirks, Eric Gatmaitan, Andrew Linder, Bobbie Brawley, Paul Avers, Laura McGuire, Dallas Oberly, Ben Damerow, Susan Flown, Ken Bauer, Doug Voshell, Kathy Regla, Chris Withers, Dave Grimmer, Ed Hammock, Jack Carlsen, Jim Burkeimer, Timothy Cotright, Mark O’Connell, Colleen Wright, Chris Walden, Brian Murphy, Scott Seppala, and Karen Rutenber.

Lansing Community College: Dr. Vicki Deketelaere, Glenys Warner, Jill Doederlein, Sid Mosley, Scott Poe, Bill Roeser, Ed Suniga, Nate Joseph, Heida Meister, Melissa Misner, Ivannda Rodgers, Keith Canfield, Bo Garcia, Sheila Fink, Joanne Deprekel, Elythe Hatter-Williams, Fred Ford, Chris Manning, Jim Bunn, Tom Possehn, Steve Ross, Michelle Cordano, Ursula Harris-Johnson, Carrie Rosingana, and Ann Lapo.

Lake Michigan College: Ken Flowers, Lynette Wolf, Karen Broadwater, Melissa Emery, John Closson, Nathan Kramb, Steve Karsten, Kevin Kreimer, David Bloomberg, Laree Ajayi, Dr. Robert Harrison, Barbara Herrold, Brian Pekle, Jeff Bond, Dorothy Blocker, Lily Brewer, Marty Perry, and Alicia Razor.


Mott Community College: Robert Matthews, Thomas Crampton, Dr. Scott Jenkins, Joe Palaka, Jonathan Jarrett, Jerald Stanley, Matthew Sullivan, Scott Swan, Kathleen LaVallier, Myesha Cannon, Mary Fallis, Daphne Epps, Gail Bowman, Marty Sovis, Linda Walters, John Anderson.

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Executive Summary

Background
The Michigan Coalition for Advanced Manufacturing (M-CAM) initiative was designed to help unemployed adults (including TAA-certified workers and veterans) gain the skills required to fill available jobs in Michigan’s advanced manufacturing sector. The M-CAM initiative was developed by a consortium of eight community colleges in Michigan and funded by the U.S. Department of Labor’s (DOL) Employment and Training Administration (ETA) under Round 3 of the Trade Adjustment Assistance Community College and Career Training (TAACCCT) grant program.

The M-CAM leadership team selected Social Policy Research Associates (SPR) as the initiative’s third-party evaluator in March 2014. This mid-project report highlights implementation of the M-CAM TAACCCT grant as of summer 2016, with a focus on describing key features of the initiative, factors influencing implementation, and preliminary outcomes. The report draws on three rounds of site visits to each college, case study interviews with students, a student survey, Efforts To Outcomes (ETO) data on student participation, and wage data from the state of Michigan.

Structure and Management of Grant
The key entities in the M-CAM initiative include the Board of Advisors, made up of Presidents of each college, Macomb as the lead college for the consortium, and the M-CAM operational staff within the industrial trade and workforce divisions at each of the eight colleges.

As the lead college, Macomb oversees work plan implementation, convenes meetings of colleges and key partners, reports on outcomes to DOL, and coordinates with contractors (including the third-party evaluator, technical assistance provider, and communications firm).

Each college in the consortium, with the exception of Bay, is responsible for leading at least one M-CAM activity. As an Activity Lead, a college is responsible for (1) developing a work plan for task execution, (2) convening colleges to discuss approaches related to the activity, (3) developing a common M-CAM implementation approach.


- Colleges are using the $24.9 million grant to update equipment and on-campus technology, enhance coordination and build capacity across the eight colleges, improve student access to career advising, and engage employers to better align training to meet future job needs.

- Colleges are focused on enhancing curriculum and hands-on learning opportunities with new equipment in four M-CAM pathways: Production, Welding, CNC Machining, and Multi-Skill Technician/Mechatronics.

- A key focus of the grant has been on aligning training curricula across each of the eight colleges to industry standards and industry-recognized credentials.

- In order to develop a comprehensive career pathways system, colleges also focused on developing intensive upfront assessment and career counseling, foundational skills training, and job placement services.
Student Enrollment and Completion
At the point that this Mid-Project Report was written, M-CAM had already exceeded its TAACCT-grant enrollment goals: the colleges had enrolled 3,042 students in M-CAM, representing 111 percent of the cumulative enrollment goal for the entire grant.

As of July 31, 2016, half of all M-CAM participants were still enrolled in M-CAM programs. Over a third (40 percent) of all participants had completed and exited, while 10 percent withdrew from M-CAM programs without completing. The student survey results show that students who withdrew did so primarily because of life conflicts, rather than because of dissatisfaction with their training.

There is broad variation in the age and life-experience “profile” of students. Six in 10 M-CAM students are either over 40 or under 25 years of age. Students in these two groups typically have very different “profiles” in terms of their work experience, understanding of manufacturing trades, and life responsibilities. Furthermore, students who faced significant life challenges, including housing instability, criminal history, and transportation challenges often viewed M-CAM as a vital “second chance.”

- Sixty percent of M-CAM participants are white males. One-quarter of students are African American and less than 13 percent are female.
- The 29 percent of participants who were over the age of 40 often viewed M-CAM as a chance to upgrade their manufacturing skills to improve employment prospects.
- In contrast, the 31 percent of participants under the age of 25 were often still in an exploratory mode as to their career path.
- Half (49 percent) of M-CAM participants were employed at the time of enrollment and looking to upskill so that they could move into higher paying manufacturing jobs.

Enrollment by College
Number of Participants and Percent of Enrollment Target Reached

<table>
<thead>
<tr>
<th>College</th>
<th>Participants</th>
<th>Enrolled</th>
<th>Percent of Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bay</td>
<td>148</td>
<td>101%</td>
<td>132%</td>
</tr>
<tr>
<td>Grand Rapids</td>
<td>188</td>
<td>107%</td>
<td>96%</td>
</tr>
<tr>
<td>Kalamazoo</td>
<td>279</td>
<td>144%</td>
<td>96%</td>
</tr>
<tr>
<td>Lake Michigan</td>
<td>758</td>
<td>132%</td>
<td>101%</td>
</tr>
<tr>
<td>Macomb</td>
<td>501</td>
<td>101%</td>
<td>96%</td>
</tr>
<tr>
<td>Mott</td>
<td>388</td>
<td>101%</td>
<td>96%</td>
</tr>
<tr>
<td>Schoolcraft</td>
<td>608</td>
<td>101%</td>
<td>132%</td>
</tr>
</tbody>
</table>

Enrollment by Career Pathway

<table>
<thead>
<tr>
<th>Pathway</th>
<th>Participants</th>
<th>Enrolled</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNC Machining</td>
<td>775</td>
<td>34%</td>
<td>Non-Credit</td>
</tr>
<tr>
<td>Multiskilled</td>
<td>743</td>
<td>56%</td>
<td>Non-Credit</td>
</tr>
<tr>
<td>Production</td>
<td>601</td>
<td>59%</td>
<td>Non-Credit</td>
</tr>
<tr>
<td>Welding/Fabrication</td>
<td>902</td>
<td>60%</td>
<td>Credit</td>
</tr>
</tbody>
</table>
Recruitment Practices
The success of M-CAM colleges in surpassing their overall enrollment goals for the grant is particularly impressive when one considers the broader context for enrollment at each of the colleges. Overall, enrollments across all of the M-CAM colleges declined over the course of grant implementation, mainly because of the thriving economy and the demand for labor among local employers. M-CAM staff members, therefore, had to be particularly aggressive in their recruitment efforts to ensure that programs were full and that they were reaching their target enrollment goals.

College staff reported that the grant greatly increased the ability of colleges to market their programs and to increase awareness of manufacturing sector training and employment opportunities. A staff member at Kellogg said, “M-CAM has helped to increase marketing… in industrial trade programs and occupations. The grant has put us on the map.” With the support of grant funds, colleges distributed pamphlets, conducted presentations at partner organizations, and advertised in local newspapers.

Foundations for M-CAM Training
M-CAM’s training programs are administered at the college level and, thus, the training curricula were developed independently at each college. Nevertheless, for the initiative to function as intended and realize its goals, the colleges in the consortium had to coordinate their work in identifying skills gaps, developing their training programs and aligning them to industry standards.

To facilitate this process, M-CAM created a workgroup for each industry pathway made up of key faculty members, instructors, and staff members. These groups worked to achieve the following: make the curricula within each pathway more employer-focused across colleges in the consortium, identify appropriate industry-credentials and enhance alignment with national industry-recognized credentials, develop technology-enabled learning strategies (e.g., hands-on learning, online coursework, online communities), and incorporate updated technology into the course content.

Furthermore, in order to revise curriculum and training programs, colleges needed to select and purchase equipment and actively engage employers to ensure that programs aligned with industry standards.

Promising recruitment practices include: (1) presentations by employers and faculty at recruitment orientations to help prospective students understand the value and importance of training; and (2) close collaboration with key partner agencies to facilitate recruitment, particularly when it comes to recruiting vulnerable populations.

Recruitment challenges included negative perceptions of manufacturing among students and their families, low entry-level pay in production, and limited college staff dedicated to recruitment.

The majority of the colleges spent between 20 and 40 percent of their grant funds on new equipment. These purchases increased the availability of hands-on, experiential learning for students on the types of equipment used by industry partners. Nearly half of the equipment purchased was used to strengthen the Multi-Skill Technician/Mechatronics pathway.

M-CAM supported a tremendous infusion of new equipment for colleges, a number of which had limited opportunities to invest in equipment prior to the TAACCCT grant.
Employer Engagement
The colleges all had employer relationships prior to M-CAM, but the M-CAM grant required that they reconnect with their employer base and strengthen those relationships. M-CAM staff and faculty members worked with employers to inform all aspects of the implementation of the pathways model, particularly alignment of curricula with industry practices, standards, and credentials, and development of employment and work-based learning opportunities. In this process, the career coaches and job development staff members were instrumental in helping colleges reach out to employers and increase employer engagement, particularly in job placement-related activities.

Growth in employer partnerships over the life of the grant speaks to the consortium’s deliberate efforts to actively engage employers in strengthening their career pathways, from the design phase through job placement. Consortium colleges engaged at least 188 new employers whom they had previously not worked with and leveraged those connections in meaningful ways. Furthermore, over 60 percent of employers supported colleges in five or more ways, reflecting a deep level of engagement.

Core Training Programs
M-CAM promoted important changes and improvements in noncredit and credit programs in four advanced manufacturing pathways: welding, machining, multi-skilled technician/mechatronics, and production. As of the third site visit, colleges had made the following key shifts to training programs:

- The multi-skilled technician/mechatronics pathway experienced the most change. Nine new programs were developed, while 16 were enhanced. Programs were aligned with Siemens and PMMI industry certifications.
- In welding, the colleges developed seven new programs and enhanced 14. Key changes included the addition of robotic welders and virtual welders, as well as the opportunity for students to earn AWS certifications.
- Colleges developed three new programs in CNC machining and enhanced 13, primarily through the incorporation of new equipment and NIMS industry certifications.
- Colleges developed at least five new production programs and enhanced others with the addition of MSSC Certified Production Technician certifications.

- Across the consortium, the number of reported employer partnerships nearly doubled, from 204 in Fall 2014 to 392 in Spring 2016.
- 356 employers across the colleges (91 percent of total employer partners) assisted with job placement for students. These employers interviewed participants at the college, participated in job fairs, and actively coordinated with M-CAM staff members to hire students. Two of the most common roles were posting job listings (75 percent) and coordinating with M-CAM job developers to hire students (50 percent).

- Ninety percent of students surveyed were satisfied or very satisfied with the training they had received.
- There were no significant differences in student satisfaction by college or by career pathway. Satisfaction ranged from 88 percent in machining to 92 percent in production.
- Students who were interviewed appreciated:
  - The high quality of instructors, who they viewed as having deep levels of industry experience
  - Hands-on and applied approach to learning
Pathway Enhancements

M-CAM aimed to promote individuals’ access to career pathways in manufacturing by strengthening students’ academic and “soft” skills, allowing them to earn credit for what they already know, and providing mechanisms for them to transfer credit from one institution to another so that they can continue their training. As of the third site visit, colleges had made the following changes to enhance career pathway supports for students:

- Colleges had worked to strengthen students’ foundational skills by harnessing and supplementing existing college resources, enhancing contextualized learning in core training programs, incorporating online basic skills testing and remediation, creating boot-camp style pre-enrollment cohort programs, and providing supplemental workshops.
- Colleges used technology to enhance pathways. For instance, colleges incorporated Tooling U, MSSC online courses, and AMTEC into curricula to create hybrid course options.
- Colleges were laying the ground work for students to receive credit for coursework completed at one college (or high school) when transferring to another institution or, in the case of noncredit-to-credit articulation, when transferring from one division to another in the same college.
- In developing articulation agreements, the colleges had identified industry certifications within each pathway, engaged their registrars in establishing equivalency values for each certification, and were in the process of implementing articulation agreements with other M-CAM colleges, as well as two four year colleges—Eastern Michigan University and Ferris State University.
- Although all M-CAM colleges had strategies for assessing and awarding credit for prior learning, using these assessments in the advanced manufacturing pathways had not yet been a strong focus of grant implementation.
- Employer partners strongly emphasized the need for colleges to focus on strengthening students “soft skills,” such as punctuality and communication skills.
- Promising practices in promoting foundational skill development included:
  - Strengthening coordination between existing programs on campus
  - Offering more remediation in technical math
  - Having employers talk to students about the importance of “soft skills.”
- Challenges to incorporating a focus on foundational skills include resistance from faculty to incorporating foundational content into manufacturing courses and low attendance at optional workshops.
- M-CAM students who were interviewed generally wanted to focus on technical training and did not feel as though they needed support for foundational skills.
- M-CAM students were also generally unaware that they could earn credit for prior learning.
Counseling and Student Support
A key goal of the M-CAM initiative was to create an intrusive case management and career coaching system through which students would receive a wide variety of counseling and support services, including academic advising, help with educational planning, career coaching, job search and job placement assistance, and referrals for supportive services. With TAACCCT grant funding the colleges hired additional staff members with a variety of titles (e.g. career coaches, success coaches, intake and enrollment staff, and job developers) to provide these services. In this report, we describe these staff as career coaches, even though their titles varied. Colleges also strengthened student supports by strengthening on- and off-campus partnerships—with college admissions, advising and job placement offices, Michigan Works!, Public Welfare Department, employer associations, and community- and faith-based organizations.

M-CAM career coaches work with credit students mainly on an as-needed basis whereas their interaction with noncredit students, though variable across the consortium colleges, usually occurs at regular intervals. The frequency of meetings with noncredit students varied from three times a week to once a month. During these meetings, career coaches provided four core types of support.

- Academic support, such as selecting a career pathway and training program, choosing courses and setting up class schedules, navigating the college enrollment process (e.g., college paperwork, assessments, financial aid), improving study skills, and accessing college tutoring services.
- Career information and counseling, such as assisting students with developing or improving their resumes and developing cover letters, by providing information on how to look for jobs and succeed in employment interviews.
- Job search and placement, such as providing job announcements, assisting with job search, coordinating hiring events like job fairs, and matching students to job or work-based learning opportunities.
- Dealing with life issues by assisting students to deal with life challenges and referring students to supportive services such as financial aid, childcare, and transportation assistance.

- College leads often reported that the largest “added-value” of M-CAM was the enhanced counseling and student support services.

- The amount of staff providing counseling and supportive services varied significantly by college. One college had only one part-time staff member who managed the grant and provided all supportive services. Other colleges had 4-5 staff members dedicated to providing these services.

- While M-CAM coaches are the main providers of student support, instructors at the M-CAM consortium colleges also advise students about academic planning and scheduling, provide them with instructional assistance and career advice, and, in some cases, help connect them to jobs, internships, and apprenticeships.

- Among student survey respondents:
  - 87 percent were satisfied with the academic support services.
  - 84 percent were satisfied with career information and counseling.
  - 82 percent were satisfied with job search and job placement.
  - 89 percent were satisfied with help they received with life issues.
Participant Outcomes to Date
The M-CAM consortium strives to promote clear career pathways to well-paying advanced manufacturing jobs for participants. Key participant outcomes of interest include certifications and employment outcomes, such as employment placement, retention, and wages. Outcomes within this section are for the 40 percent of M-CAM students that have completed their studies and been exited from M-CAM services.

M-CAM participants across the eight colleges have earned 1,727 college certificates, 1,482 professional credentials, and 83 degrees. By the time they exited TAACCCT services, the majority of participants (87 percent) left their college with at least one of these certifications.

Close to three-quarters of participants who successfully completed their programs were employed by the end of the first quarter after exit. Two percent of participants were enrolled in further education and not employed, and about one-fourth were neither employed nor enrolled in further education.

- Older participants and African American participants were less likely than others to receive a college degree, regardless of their career pathway.
- Colleges awarded the following professional certifications: 671 AWS, 289 NIMS, 175 MSSC, 44 PMMI and 20 Siemens
- The percent of students completing any credential varied significantly by college.
- Earning a professional credential seemed to improve participants’ employment prospects more than earning a college certificate alone.
- About three out of four exited participants who completed our survey felt that their training helped them obtain their most recent job.
- The youngest and oldest participants struggled most to find employment.
- More than 80 percent of those employed after exit were employed in manufacturing-related industries.
To assess employment retention, we calculated the percentage of those employed during the first quarter after exit who were still employed during the second and third quarters after exit using employment placement data in ETO and wage records from the Workforce Development Agency. We found that employment retention averaged about 75 percent with some variation across colleges. In keeping with their lower overall rates of employment, participants under 25 years of age had the lowest rates of retention.

Wages for job placements were generally well above the minimum wage. The average wage participants received for new positions was $13.30, while the minimum wage in Michigan is $8.15. The average wages for M-CAM completers exceeds the living wage estimate of $10.10, which is the estimated hourly wage that an individual must earn to support themselves in Michigan.

About three-quarters (74%) of incumbent worker participants who successfully completed their programs earned a wage increase after enrollment. On average, incumbent workers received a 10 percent wage increase as a result of M-CAM training.

**Conclusion**

In conclusion, it is important to emphasize the role the M-CAM grant has had in strengthening the “collaborative capacity” of the colleges, which is “the ability of organizations to enter into, develop, and sustain inter-organizational systems in pursuit of collective outcomes.”

Key collaborative outcomes include:

- Stronger partnerships between the eight consortium colleges as well as between the colleges and key partners, such as employers and Michigan Works!
- Alignment of programs to industry-recognized standards
- Improved coordination among faculty, advising staff, and college career staff
- Development of a real-time, web-based database to track student characteristics and outcomes for both noncredit and credit students
- Progress on accessing wage data to track employment and wage outcomes for students
- Participants over 40 years of age made an average of $14.42 per hour, compared to $12.66 among other participants. The youngest participants, those under 25 years of age, earned an average of $9.33 per hour.
- Among incumbent workers, the value of participating in M-CAM programs seemed to be highest for workers between the ages of 25 and 40.
- African American participants earned lower wages on average than their white counterparts and were less likely to receive a wage increase if they were employed at enrollment.
- M-CAM has increased coordination between colleges in Michigan, which is notable given that it is a “non-system” state.
- The colleges also used the grant as an opportunity to “move the needle” on data access and availability. Several college presidents met with the Director of Michigan’s Talent Investment Agency (TIA) to discuss the importance of data sharing and data access. They also prepared a letter to TIA arguing for greater data access that was signed by all college presidents.

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1Hocevar, Susan Page, Erik Jansen, and Gail Fann Thomas (2011). “Inter-Organizational Collaboration: Addressing the Challenge.” [https://www.hsai.org/articles/64](https://www.hsai.org/articles/64)
Chapter 1: Introduction

The Michigan Coalition for Advanced Manufacturing (M-CAM) initiative was designed to help unemployed adults (including TAA-certified workers) gain the skills required to fill available jobs in Michigan’s advanced manufacturing sector. The M-CAM initiative was developed by a consortium of eight community colleges in Michigan and funded by the U.S. Department of Labor’s (DOL) Employment and Training Administration (ETA) under Round 3 of the Trade Adjustment Assistance Community College and Career Training (TAACCCT) grant program. The four-year grant was funded in October, 2013.

The M-CAM leadership team selected Social Policy Research Associates (SPR) as the third-party evaluator of the initiative in March 2014. SPR’s evaluation design calls for a comprehensive implementation study, an outcomes study, and a rigorous quasi-experimental impact evaluation. Because impact data will not be available until after the program ends, this mid-project report focuses on implementation progress to date and preliminary outcomes. The Final Report (to be released in Fall 2017) will include findings for all three evaluation components. This initial chapter of the mid-project report describes the economic context in Michigan, the key aspects of the M-CAM initiative itself, and the evaluation’s methods.

Economic Context

In the planning stages of the M-CAM initiative, Michigan was still recovering from the global economic recession of 2007–2009. The recession affected Michigan more harshly than the United States as a whole, and the state had not quite reached its pre-recession (2007) unemployment levels by 2013, when the DOL awarded the TAACCCT Round 3 grants (Exhibit 1). However, throughout the course of the TAACCCT grant, the unemployment rate in Michigan improved, returning to pre-recession levels in 2014 and catching up with the average level in the U.S. shortly thereafter.

Bay de Noc Community College (Bay), Escanaba MI
Grand Rapids Community College (Grand Rapids), Grand Rapids, MI
Kellogg Community College (Kellogg), Battle Creek, MI
Lansing Community College (Lansing), Lansing, MI
Lake Michigan College (Lake Michigan), Benton Harbor, MI
Macomb Community College (Macomb), Warren, MI
Mott Community College (Mott), Flint, MI
Schoolcraft College (Schoolcraft), Livonia, MI
Exhibit 1: Unemployment in Michigan and the United States


The context of an improving economy has shaped the M-CAM initiative in both positive and negative ways. Increased employer demand for skilled workers has benefitted M-CAM, because colleges have an easier time placing participants into jobs. Furthermore, because employers need workers they are motivated to engage actively with M-CAM training programs, by participating in advisory committees, offering work-based learning opportunities and incumbent worker training programs, and taking part in job placement activities such as career fairs.

On the other hand, the improving economy has made it more difficult for the colleges to recruit students into the M-CAM program; when jobs are available, individuals would generally rather work than participate in training programs. Also, as is explained further in Chapters 4 and 9, the colleges are serving many more incumbent workers and individuals with significant employment barriers than they anticipated when they applied for the grant.

The changing economy has also complicated the efforts of the colleges to reach trade-affected workers in Michigan. The number of trade-affected workers in Michigan, for example, decreased from 80,551 in the 2008–2013 period to 14,730 in the 2011–2016 period, a decline of 81.7%.

Source: U.S. Department of Labor Trade Adjustment Assistance program. [https://www.doleta.gov/tradeact/](https://www.doleta.gov/tradeact/) (accessed June 7, 2016). Search was from January 1 of the starting year to June 7 of the ending year (the date the data were collected for the report).
Manufacturing in Michigan

Largely due to the automobile industry, Michigan is ranked fifth among the states with the highest employment in manufacturing (576,576 jobs in 2014). The “big three” automobile companies—Ford, General Motors (GM), and Chrysler—were all founded in Michigan and still make the state their headquarters. Although manufacturing employment in Michigan has decreased considerably since the 1980s and 1990s, manufacturing still accounts for more than 14 percent of all jobs in Michigan, giving the state a higher concentration of jobs in manufacturing than all but nine other states.

The loss of many manufacturing jobs in the automobile industry that occurred prior to and during the great recession has left its mark on the labor supply in Michigan. Employers reported difficulty in recruiting young people into the trades because high schools do not have enough trade programs and because there is a stigma attached to entering the manufacturing field. Due to the recent history of industrial decline, manufacturing is sometimes seen by parents, teachers, counselors and students as a technologically outdated field that is unstable and not promising. M-CAM was seen by employers we interviewed as an opportunity to change this perception and showcase the cutting edge nature of advanced manufacturing in Michigan.

Exacerbating the labor shortage is the fact that many of the current industry workers are close to retirement age. M-CAM faculty members identified particular niches of advanced manufacturing that have a high concentration of skilled and semi-skilled workers who are on the verge of retiring. For example, one faculty member noted that, based on his recent industry experience, skilled tool and die makers and machine maintenance technicians are going to be in very high demand as older workers retire.

Overview of M-CAM

As described above, the M-CAM consortium was formed in the aftermath of the global economic recession of 2007–2009, when the economy in Michigan was just starting to recover. In order to train workers for the jobs expected to be in demand in the future and to meet the projected
labor-force needs of industry, the eight community colleges that are part of the M-CAM consortium have sought to use TAACCCT funding to update manufacturing equipment and technology, expand advanced manufacturing course offerings, and strengthen career pathways.

**M-CAM Service Area and Target Populations**

The M-CAM service area includes the Detroit metropolitan area as well as the cities of Flint, Grand Rapids, Lansing, Southwest Michigan, and Michigan’s rural Upper Peninsula. The target population for the M-CAM initiative includes TAA-eligible workers, veterans, and other unemployed or underemployed adults. As illustrated in the figure below, the participating colleges are in local areas with very different labor markets; in 2015, unemployment rates across the sites ranged from a low of 3.5 percent to a high of over 7.5 percent. Thus, variations in participant outcomes across the colleges need to be viewed within the context of their individual labor market conditions.

**Exhibit 2: Map of M-CAM Colleges and 2015 Unemployment Rates in Michigan**

Goals
The overall goals of the M-CAM initiative, informed by an analysis of the gap between the skills of unemployed workers and the needs of employers in the advanced manufacturing sector, follow:

- Update and align on-campus technology with industry standards
- Develop a real-time, web-based longitudinal database to track student characteristics and outcomes for reporting and evaluation purposes
- Enhance coordination and build capacity across the eight colleges by pooling expertise and developing standard core learning objectives
- Improve student access to career advising so that students can make informed career choices
- Cooperate more closely with employers to align training to meet current and future job needs.

Drawing on the results of an employer survey, the M-CAM consortium created a service model that aimed to promote job readiness skills, foundational skills, articulated career pathways, employer engagement, career planning, and prior learning assessments. The consortium also used the survey to identify training gaps, such as a lack of local access to courses for specific certificates.

M-CAM Initiative Theory of Change
The M-CAM logic model provides an overview of the theory of change that informed the initiative’s approach to implementation (Exhibit 3). It shows key partners, strategies, and anticipated outcomes and impacts. The logic model assumes that contextual factors will play a role in shaping the outcomes. The state of the economy, labor market conditions, employer needs, and regional trends in manufacturing influence the likelihood that students will elect to enroll in training and their prospects for finding employment after training. The logic model also depicts M-CAM’s organizational leadership structure, which includes the leadership team, industry advisory committees, and a Board of Advisors, as an important feature of the initiative.

The M-CAM consortium approached the realization of the initiative’s goals by implementing three strategies:

1. A pathways learning model – intensive upfront assessment and career counseling, foundational skills training, prior learning assessments, and articulated career pathways with many entry and exit points

This $24.9 million DOL grant is an important step forward for Michigan community colleges and employers in leveraging our historical strength in “making things” while harnessing the promise of advanced manufacturing for the economic benefit of our residents, businesses and communities.

– Dr. Jim Jacobs, President Macomb
Exhibit 3: M-CAM Logic Model

**Contextual Factors**
- Regional trends in manufacturing
- Labor market conditions
- Employers’ difficulty finding job-ready workers
- Strengths/gaps in capacity of colleges to expand training

**Service Model**

**Strategy 1: Develop Pathways Learning Model for TAA eligible workers and others**
- Develop team-based intake, orientation, and assessment model
- Develop career service model, resulting in individual educational development plans
- Expand foundational skills program

**Strategy 2: Develop Manufacturing Training Programs**
- Develop common learning objectives aligned with workplace competencies
- Develop stacked and latticed training programs
- Develop WBL opportunities
- Develop technology-enabled courses (online/hybrid)
- Develop pathways to other training programs
- Develop articulation agreements to facilitate transfer of credits

**Strategy 3: Develop a Job Search and Placement Program**

**Outcome / Impacts**

**College Outcomes**
- Enhanced on-campus technology to meet employer demand
- Expanded ability to offer employer-recognized credentials
- New and enhanced curricula
- Increased enrollment in manufacturing training programs
- Enhanced supports and resources for students (intake, career placement, supportive services)
- Increased data-driven decision-making

**Student Outcomes**
- Academic achievement and workplace competencies
- Training completion/credentials
- Time to credential completion
- Entered employment
- Employment retention
- Post-program earnings

**Employer Outcomes**
- More productive and better trained employees
- Hiring needs met

**Systems Outcomes**
- Enhanced collaboration and communication between coalition members (transferability of credit, enhanced sharing of best practices)
- Increased collaboration between workforce and education partners
- Increased collaboration between employers and education/workforce partners
- Strengthened regional economic partnerships

**Partners**
- 8 Coalition Colleges
- Michigan Works!
- Employers
- Non-Profit & Community Groups
- Non-Coalition Colleges
- M-CAM Project Leadership team
- Industry Advisory Committee
- Board of Advisors
- M-CAM website
2. **Manufacturing training programs** – new and enhanced curricula in the four M-CAM pathways (production, welding, CNC machining, and mechatronics); new industry-recognized credentials, college certificates, and degrees; online learning and hybrid course options; employer advisory boards; and new equipment.

3. **A job search and placement program** – job placement services, work-based learning opportunities, and building relationships with employer partners.

Taken together, these strategies were meant to ensure that students would have the supportive services, career guidance, and updated training curricula and facilities that they needed to complete training, obtain quality employment, and enjoy future wage increases. In addition to promoting these student outcomes, these strategies were intended to have college-level and system-wide impacts. Their implementation would, for example, enhance bridges between credit and non-credit programs and articulation agreements with other colleges, which would make it easier for a student to start in a non-credit course and then transfer to a credit or degree program. On a consortium-wide level, the strategies aimed to increase collaboration between colleges, enhance relationships with employers, and promote economic resilience in the region.

**Overview of this Report**

This mid-project report describes and analyzes implementation of the M-CAM TAACCCT grant to date and seeks to answer the following three research questions:

- How and to what extent has each college implemented the key features of the M-CAM initiative?
- What factors have influenced grant implementation?
- What are the preliminary outcomes of M-CAM at the participant and college-level?

SPR’s evaluation includes multiple sources of qualitative and quantitative data, all of which will be highlighted in this report. In particular, SPR is drawing on three two-day site visits to each college (conducted in the fall of 2014, spring 2015, and spring 2016). These visits included semi-structured interviews with college presidents, faculty, students, employers, key partners and grant-funded staff. In addition to site visits, SPR is drawing on phone interviews with students, a survey of student completers and non-completers, and observations of consortium meetings (either by telephone or in person). Quantitative sources include administrative data on student characteristics, participation and outcomes from the Efforts To Outcomes (ETO) participant database, as well as wage and employment data on participants from the State of Michigan.

A full list of SPR’s evaluation research questions and a detailed list of data sources is in Appendix A.

The next two chapters provide more detail on the structure and maintenance of the M-CAM initiative at the consortium level (Chapter 2) and the college level (Chapter 3). Chapter 4 describes recruitment and intake activities, enrollment, and participant characteristics. Chapters 5, 6 and 7 describe how the consortium developed manufacturing training programs by enhancing...
specialized training programs (Chapter 5 & 6) and shifting to a pathways model of training (Chapter 7). Chapter 8 provides an overview of supportive services that were provided to M-CAM participants. Chapter 9 examines participant outcomes to date. Chapter 10 concludes the report with a summary of college-level outcomes and next steps for the evaluation.
Chapter 2: Structure and Management of the M-CAM Initiative

As discussed in the introduction, M-CAM involves coordinating training programs among eight completely independent colleges, each of which conducts grant-supported training programs and activities (described in subsequent chapters). It is important to note that Michigan’s community colleges are not part of any statewide community college system; they have administrative autonomy and are not required to submit reports to a state-level higher executive officer. This autonomy provides Michigan community colleges with a great deal of flexibility to adapt their programs to the needs of their surrounding communities, but it also presents considerable challenges for the implementation of a project like M-CAM, which seeks to align efforts across colleges. As a multi-program initiative that involves many entities, M-CAM requires complex oversight, management, and coordination, thus requiring a robust management structure at the consortium-level. This chapter provides an overview of how these functions are structured, staffed, and carried out.

Consortium-level Leadership and Management

The key entities in the M-CAM initiative include the Board of Advisors, made up of Presidents of each consortium college, Corporation for a Skilled Workforce (CSW) as a third-party technical assistance provider, Macomb as the lead college for the consortium, and the M-CAM operational staff within the industrial trade and workforce divisions at each of the eight colleges. As illustrated in Exhibit 4, the Board of Advisors provides high-level oversight for the work of the entire consortium and provides guidance to Macomb, which is responsible for consortium coordination, deliverables, and accountability and reporting. Macomb has three staff members that manage and provide oversight for the grant. Within the industrial trade and workforce divisions of each college, there is a project lead and a project manager that provide oversight of the M-CAM training programs. Most colleges also have additional grant-supported staff members.

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Exhibit 4: Organizational Structure of the M-CAM Initiative

As members of the Board of Advisors, the college presidents provide high-level guidance to and oversight of grant implementation. Presidents met quarterly in the first year of the grant and then as needed after that point. Although they are not involved in the day-to-day administration of the grant, the college presidents removed roadblocks and raised the profile of M-CAM at each of the institutions. With respect to the data needs of the evaluation, the college presidents were instrumental in increasing access to wage data from the state of Michigan and ensuring that comparison group data were available for each of their institutions.

As the consortium lead, Macomb is responsible for the fiscal management and oversight of the grant. Macomb oversees work plan implementation, convenes meetings of colleges and key partners, reports on outcomes, coordinates with contractors (including the third-party evaluator, technical assistance provider, and communications firm), and monitors the grant. Macomb is also responsible for interacting with and reporting to the DOL. As of the Spring of 2016, Macomb had three staff members responsible for coordinating grant activities: a Consortium Lead, a Consortium Manager, and an Administrative Assistant. Other staff members at the college, such as staff members from the finance department, also helped to support grant administration.

As illustrated in Exhibit 5, each college in the consortium, with the exception of Bay, is responsible for “leading” at least one M-CAM activity. As an Activity Lead, a college is responsible for (1) developing a work plan for task execution, (2) convening colleges to discuss approaches and share best practices related to the activity, (3) summarizing baseline approaches or capacities at each of the colleges, and (4) developing a common M-CAM implementation approach for the activity. As Activity Lead for Intake and Enrollment, for instance, Mott developed sample intake forms and enrollment procedures. Similarly, as Activity Lead for Technology-based Learning,
Kellogg developed an online learning community for M-CAM, students and faculty (this will be discussed in further detail in Chapter 5). The colleges serving as leads for the four career pathways held quarterly (and, in some cases, monthly) meetings during which they discussed which industry certifications best met their local employers' needs and how to build industry certifications into their noncredit and credit training programs.

Exhibit 5: College Activity Leads

- Macomb: Consortium Lead
  - Mott: Intake and Enrollment
  - Grand Rapids: Foundational Skills and Welding Training
  - Lansing: Production Training and Job Placement Model
  - Schoolcraft: CNC Machining Training
  - Macomb: Multiskill Technician/Mechatronics and M-CAM Articulation Agreement
  - Lake Michigan: Articulated pathways to other education and training programs, transfer agreements to bachelor's degree programs
  - Kellogg: Technology-Based Learning

In Spring 2015, Macomb contracted with Corporation for a Skilled Workforce (CSW) to provide technical assistance to consortium colleges. The role of CSW has been to (1) facilitate meetings and cross-college exchange, (2) provide individual coaching to each college on grant implementation, and (3) support Activity Leads in the development of required grant deliverables.

Consortium-level Coordinating Activities

As illustrated in Exhibit 6, several mechanisms are used to coordinate grant activities and facilitate peer exchange among consortium members. Key among these mechanisms have been monthly in-person “Strategy and Operations” meetings, periodic faculty meetings for each of the four career pathways (welding, CNC machining, mechatronics, and production), meetings with key partners like Michigan Works!, and multi-day semi-annual meetings. These in-person meetings are supplemented with periodic webinars and conference calls on key topics. Consortium stakeholders also use a Dropbox site to share documents and resources across colleges.
<table>
<thead>
<tr>
<th>Activity</th>
<th>Participants</th>
<th>Description</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strategy and Operations Meetings</strong></td>
<td>M-CAM leads and managers from each college, M-CAM Consortium Lead, CSW staff members, and other partners as needed.</td>
<td>These in-person meetings are held the third Thursday of every month, 10am-2pm.</td>
<td>Monthly</td>
</tr>
<tr>
<td><strong>Bi-annual Meetings</strong></td>
<td>M-CAM leads and managers from each college, M-CAM Consortium Lead, M-CAM Consortium manager, other M-CAM staff members (career coaches, job developers, registrar staff), and CSW staff members</td>
<td>Attendees of these two-day in-person meetings vary depending on the focus of the meeting. Meetings have focused on an overview of M-CAM, intake and enrollment processes, and M-CAM deliverables.</td>
<td>Twice a year</td>
</tr>
<tr>
<td><strong>Board of Advisors Meetings</strong></td>
<td>College presidents and M-CAM Consortium Lead</td>
<td>During these meetings, the college presidents get updates on the status of M-CAM.</td>
<td>As needed</td>
</tr>
<tr>
<td><strong>Industry Pathway-Specific Meetings</strong></td>
<td>M-CAM college leads, M-CAM college faculty, and CSW staff members</td>
<td>These meetings have occurred either in-person or as conference calls. During these meetings faculty make decisions about alignment of courses and industry credentials.</td>
<td>As needed</td>
</tr>
<tr>
<td><strong>Partner Engagement Meetings</strong></td>
<td>M-CAM leads and managers, CSW staff members, and M-CAM partners such as Michigan Works! and Michigan Manufacturing Technology Centers (MMTC)</td>
<td>M-CAM partners have held at least two consortium-wide meetings with Michigan Works staff members and two consortium-wide meetings with MMTC. Another Michigan Works meeting is scheduled for Fall 2016.</td>
<td>As needed</td>
</tr>
<tr>
<td><strong>Consortium calls/webinars</strong></td>
<td>M-CAM leads and managers and CSW staff members</td>
<td>These meetings are for sharing information between the in-person meetings.</td>
<td>As needed</td>
</tr>
<tr>
<td><strong>Weekly Update</strong></td>
<td>M-CAM leads and managers and CSW staff members</td>
<td>All “need to know” consortium information is summarized in one weekly email.</td>
<td>Weekly</td>
</tr>
<tr>
<td><strong>Dropbox document sharing</strong></td>
<td>M-CAM leads and managers and CSW staff</td>
<td>Dropbox is used for sharing of internal information across the colleges</td>
<td>Ongoing</td>
</tr>
<tr>
<td><strong>Website</strong></td>
<td>External stakeholders</td>
<td>The website is used for external communication and sharing of information.</td>
<td>Ongoing</td>
</tr>
</tbody>
</table>

Among the consortium connection activities, M-CAM leads identified the monthly in-person “strategy and operations” meetings as particularly useful. Macomb launched these meetings in the Spring of 2015, after it became clear that existing communication strategies, such as regular conference calls, were insufficient for achieving the aims of the grant. The in-person strategy and operations meetings proved essential for cementing cross-college relationships and for getting the traction needed to complete grant deliverables. Their success depended in large part on the attendance of the college leads, who had the authority to make decisions and act on key...
decision-points. During these meetings, attendees discussed, and made considerable progress on, matters relating to some of the consortium’s most important accomplishments:

- **Implementation of work plan components.** Each of the initiative’s work plan components (such as developing a common intake system, integrating foundational skills, and developing a job placement system) was assigned a college lead. The lead colleges worked closely with the consortium leadership team at Macomb and CSW to support M-CAM implementation consortium-wide.

- **Pathway development and identification of industry credentials.** A cross-college group, consisting of college leads and faculty members, was formed for each of the four major training areas (machining, welding, mechatronics, and production). The first step that consortium members took was to develop a list of competencies, skills, and abilities that would be taught across their courses; as part of this process, they surveyed a sample of industry representatives within their core geographic areas to ensure that these competencies, skills, and abilities were valued by employers. They then identified existing industry-recognized credentials for each career pathway area and mapped the curriculum competencies to that shared industry standard.

- **Partner engagement.** Consortium stakeholders have met with Michigan Works! and Michigan Manufacturing Technology Center (MMTC) to discuss how to strengthen career pathways at a regional level. The consortium has also worked with Michigan’s Trade Adjustment Assistance lead in identifying opportunities to engage TAA-affected workers and local rapid response staff members who conduct outreach to this population.

- **Data availability and access.** Access to wage data is key to the ability of consortium member colleges to track the employment and retention outcomes of M-CAM students. Towards this end, the college presidents met with the lead for the state Talent Investment Agency and wrote a joint letter advocating for broader access to wage data. Several college staff members also distributed existing agreements they had with their local WIBs to share data on participants.

- **Communications and dissemination.** The colleges worked on the development of an M-CAM website and shared information on M-CAM at conferences and other industry events. In 2016, the consortium contracted with a communications firm to help “tell the story” of M-CAM to key stakeholders, particularly industry.

As will be discussed in more detail in subsequent chapters, faculty across the different colleges appreciated the in-person meetings that focused on pathway development and identification of industry credentials. Initially, many faculty members expressed reticence in incorporating industry certifications into their noncredit and credit training programs. But, after attending training and becoming certified themselves, faculty members began to see the utility of industry certifications and the possible ways noncredit students could use the certifications to transition into credit programs. Faculty members also greatly appreciated the opportunity to interact and network with faculty from other colleges. A number of faculty representatives from across the M-CAM consortium reported that the career pathway discussions helped them identify new learning opportunities for their students and ways to save money on educational materials.
In general, the colleges used their in-person meetings to create a sense of community and get ideas for how to tackle common challenges. They shared information on recruitment, credit articulation, engagement of faculty, lynchpin partnerships, and so on.

**Challenges to Consortium-Management**

M-CAM’s consortium experience is similar to other large complex initiatives, in that key partners spent the early part of the initiative establishing a collective vision, defining roles, and establishing accountability mechanisms.

- **Creating and nurturing a shared vision.** In the early stages of the initiative, there was an uneven level of understanding among college leads about what the colleges had committed to as part of their participation in the grant. Once the leads had an understanding of grant deliverables and requirements, there were multiple stakeholders, such as grant-funded staff and faculty, within each college that needed to buy-in to the vision in order to move the initiative forward. College presidents and leads were key to communicating a value for the goals of the grant.

- **Establishing lines of authority and group accountability mechanisms.** In a collaboration such as M-CAM, leadership is dispersed and control is shared and mutual. Collaborators share accountability and risk. It took time for M-CAM to develop group strategies to hold each other accountable for doing their part, given that Macomb, as the lead college, had limited authority over the other colleges. Although timeliness in completing key deliverables has remained a challenge for colleges, accountability developed over time, and has been based in strong relationships, a sense of mutual goodwill, and the development of consistent mechanisms for documenting the commitments and progress that collaborators have made.

- **Supporting peer exchange and learning.** College leads and grant-funded staff are eager to learn from one another. It has not always been easy, however, to figure out how to effectively support peer learning and exchange, particularly among front-line staff, such as the career coaches or job developers. As will be described in the chapters that follow, the consortium has developed and is still in the process of developing mechanisms (such as online learning communities and exchanges at in-person meetings) to enable college staff at all levels to share effective practices.
Chapter 3: College-Level Grant Implementation

An understanding of the unique qualities and capacities of each of the eight M-CAM colleges is essential to understanding why individual programs, levels of enrollment, and outcomes vary from college to college. Each college is unique in terms of its local economic context, the robustness and characteristics of its industrial trade and workforce programs, and its relationships with faculty unions, local workforce providers, and local employers. In addition to these factors, M-CAM grant implementation has been shaped by the size of the M-CAM grant that each college received, the programs selected for development at each college, and the level of grant-funded staffing. This Chapter highlights some of these variations, thus setting the stage for subsequent Chapters, which go into depth about how the grant has influenced the industrial trade and workforce programs and services available to students at each college.

M-CAM Training Programs

M-CAM colleges differ in their training program offerings, both in terms of the balance of credit and noncredit courses and the specific pathways that they offer to students. In this section we provide an overview of programs offered. See Chapter 4 for detailed information on enrollment and Chapters 6-7 for detailed information on each of the programs.

Credit courses are generally for students interested in earning a degree or college certificate. Each course is usually a full quarter or semester long, and students who take the classes get academic credit and a letter grade. (Kellogg is an exception to this pattern; it offers open entry and open exit training programs for which students receive fractional credit.)

Noncredit classes are designed for students who want to learn or upgrade skills quickly so that they can enter the workplace; students often earn a certificate of completion, and may also earn an industry-certified credential. Some noncredit programs are open-entry (available to anyone who signs up). In the case of industry-specific and customized noncredit training, the training is usually offered to incumbent workers or individuals who meet specific enrollment requirements of a local employer or industry. Noncredit M-CAM programs generally consist of short-term classes (often full-time for 4–8 weeks) offered through the workforce division or continuing education division of the college.

Faculty member, Macomb
As illustrated in Exhibit 7, the colleges offer the following mix of programs:

- **Credit programs.** All of the colleges are enrolling for-credit M-CAM students in at least two of the four advanced manufacturing programs. Kellogg and Lake Michigan offer only programs for credit, while Bay and Schoolcraft offer mostly programs for credit (e.g. 11 percent or fewer of M-CAM students are in noncredit programs).

- **Noncredit programs.** Six of the colleges are enrolling M-CAM students in noncredit courses. The majority of students at Grand Rapids, Lansing, Macomb, and Mott are noncredit students.

As is described further in Chapter 6, the decision to develop or enhance credit versus noncredit classes in M-CAM pathways was rooted mostly in the way that industrial trade and workforce programs at each of the colleges are structured. The colleges that have a well-developed noncredit workforce division, tended to focus on the development or enhancement of noncredit programs first, because of the ability of these divisions to be flexible, adaptable, and to set up courses quickly in response to employer demands. In contrast, the development or enhancement of credit programs is a lengthy and involved process at most colleges, requiring layers of administrative and faculty review and approval about such things as the time involved in the course, the qualifications of the instructor, and the degree of academic rigor. As a result, the M-CAM colleges that did not have well-developed non-credit programs tended to be slower to enroll (once again, the exception is Kellogg, which has a unique model). Although slower to start, it is possible that the new credit programs will be more sustainable after the sunset of the grant, because they have gone through such lengthy review and are more integrated into the permanent fabric of the college. This is something SPR will explore further in our final report.

**Exhibit 7: M-CAM Programs offered by each college**
*(Based on ETO enrollments)*

<table>
<thead>
<tr>
<th>Welding/Fabrication</th>
<th>Macomb</th>
<th>Kellogg</th>
<th>Schoolcraft</th>
<th>Lansing</th>
<th>Grand Rapids</th>
<th>Lake Michigan</th>
<th>Mott</th>
<th>Bay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credit</td>
<td>✔</td>
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<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔*</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Non Credit</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td></td>
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<thead>
<tr>
<th>CNC Machining</th>
<th>Macomb</th>
<th>Kellogg</th>
<th>Schoolcraft</th>
<th>Lansing</th>
<th>Grand Rapids</th>
<th>Lake Michigan</th>
<th>Mott</th>
<th>Bay</th>
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<tbody>
<tr>
<td>Credit</td>
<td>✔</td>
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<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔*</td>
<td>✔</td>
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</tr>
<tr>
<td>Non Credit</td>
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<tr>
<th>Multi-Skilled Technician/Mechatronics</th>
<th>Macomb</th>
<th>Kellogg</th>
<th>Schoolcraft</th>
<th>Lansing</th>
<th>Grand Rapids</th>
<th>Lake Michigan</th>
<th>Mott</th>
<th>Bay</th>
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<tbody>
<tr>
<td>Credit</td>
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<td>✔</td>
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<td>✔</td>
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<tr>
<td>Non Credit</td>
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<td>✔</td>
<td>✔</td>
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<table>
<thead>
<tr>
<th>Production Operations</th>
<th>Macomb</th>
<th>Kellogg</th>
<th>Schoolcraft</th>
<th>Lansing</th>
<th>Grand Rapids</th>
<th>Lake Michigan</th>
<th>Mott</th>
<th>Bay</th>
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<tr>
<td>Credit</td>
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</table>

* Low enrollment either because program was discontinued or because program is still under development
As is described in much more detail in Chapter 6 and 7, the colleges also differ in which of the four advanced manufacturing training programs they offer. Although the M-CAM proposal made it appear that all of the colleges would offer all programs, it became clear in the early phase of the grant that this was not possible given the existing array of programs at the colleges, the capacity of faculty, and the work required to develop new programs. Thus, colleges decided to build upon and strengthen their existing programs, while developing new training programs in one or two pathways (typically in mechatronics or production).

- **Welding** is offered by all eight M-CAM colleges and is the largest M-CAM training area in terms of enrollment. Welding programs prepare students to work as welding assistants, welders, production assistants, fabricators, and pipe fitters. Seven of the colleges enrolled M-CAM students in for-credit welding programs, with the potential to complete a college degree, Associate degree, or a certificate in welding. Six colleges enrolled students in noncredit programs in welding, where students could learn the fundamentals of welding for entry-level positions as well as American Welding Society (AWS) industry certifications.

- **Computer Numerical Control (CNC) machining** prepares students for careers as operators, machinists, programmers, tool and die makers, and engineering technicians. Six colleges⁴ have enrolled M-CAM students in for-credit CNC machining programs, leading to associate degrees, and four have also enrolled students in noncredit CNC machining programs.

- **Multi-skill/Mechatronics programs** have been an area of development for several colleges over the course of the grant. These programs train students for careers in machine repair and assembly line maintenance, as well as robotics. All colleges attempted to provide some type of multi-skill or mechatronics training. Seven offered credit programs, while four offered noncredit programs. Three colleges were in the early stages of launching their Multi-Skilled Technician/Mechatronics programs at the time of our third site visit.

- **Production** programs are entry-level manufacturing programs offered by four of the colleges (one college—Macomb—had such a program but discontinued it). Students in these programs are prepared to enter careers on assembly lines and in quality control or to transition into more intensive advanced manufacturing programs like those described above. For the most part production programs are noncredit, with the exceptions of the programs at Lansing (where students can be awarded credit after completing their MSSC) and Kellogg (where all programs are offered for credit).

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⁴ This includes only colleges that enrolled M-CAM students in CNC machining. Lansing offers CNC machining at the college but did not enroll M-CAM students into this program.
Grants Size and Grant-funded Staffing

Grants ranged from a low of 1.1 million dollars at Schoolcraft to 9.6 million dollars at Macomb.\(^5\) Variations in funding reflect the different roles that the colleges have as well as expectations for how many students would enroll at each college. Funding differences led to very different staffing levels at the different colleges.

Successful grant implementation depends on the effort of a broad range of individuals at each college, not all of whom received direct grant support. Furthermore, among grant-funded staff members, some positions were at a set percentage of Full-Time-Equivalency (FTE), while other staff members were paid on an hourly or task-specific basis for work performed (such as curriculum development or teaching a non-credit class).

M-CAM activities at each college are under the direct supervision of one or more M-CAM leads. With the exception of the lead at Bay, the salaries of M-CAM leads are not paid for from the grant. These individuals are generally organizational leaders, with titles such as Director of Workforce Development. The M-CAM leads play important roles in M-CAM operations at each college and coordinate implementation and communication with the other colleges. They also supervise the work of other grant-funded staff members and represent and promote the M-CAM initiative to senior college leaders, such as the college president and industry partners.

Under the guidance of the designated M-CAM lead, M-CAM programs and activities at each college are primarily carried out by a team of grant-funded staff members and by college faculty members in each of the career pathways areas (only a few of which receive direct grant funding). The number of M-CAM staff members hired by the grant varies significantly from college to college, depending both on the size of the college and the level of its M-CAM grant funding. The smallest college in the consortium, Bay, has two M-CAM staff members who each play multiple roles within the grant, whereas the largest college, Macomb, has 10 paid M-CAM staff members (not including the staff members working to manage consortium activities). Below we discuss the major categories and roles of staff members hired with M-CAM funds across the consortium.

\(^5\) Macomb’s $9.6 million grant includes funding for consortium coordinating activities, including expenses associated with reporting, convenings, third party evaluation, and technical assistance activities.
colleges. More information on the roles of these staff members is included in the Chapters that follow.

- **Project managers.** All colleges have hired a full-time M-CAM grant manager who supervises other grant-funded staff members, oversees and manages M-CAM-related tasks, and assists with grant-related reporting. At some of the smaller and more rural schools, such as Bay and Lake Michigan, project managers wear multiple hats: they also act as career coaches, help with enrollment and intake, and are responsible for data entry and reporting.

- **Career or success coaches and job developers.** All colleges have hired individuals to play the role of “career or success coach (For the sake of simplicity, we refer to these staff members as career coaches throughout this report.) Some have also hired separate job developers. As stated above, some of these individuals also serve as project managers. Career coaches and job developers assist with outreach and enrollment activities and help students with job search and placement in internships and jobs. At colleges with larger M-CAM teams, the duties of the career coach are split among multiple staff members.

- **Intake and enrollment personnel.** Seven colleges have hired staff members to be responsible for intake and enrollment. These staff members recruit students into the M-CAM program, hold orientation sessions, and help to step participants through the enrollment process. At some colleges, they also assess what resources and supports students need and what additional benefits they might be eligible for.

- **Administrative, communications, and data entry personnel.** Six colleges hired staff to provide administrative and data entry support to the program. These staff members help to manage the project, document progress, and input information into the ETO system. Two colleges hired communications staff members to help recruit participants and capture impact stories.

- **Instructors for Foundational Skills and Workplace Competencies.** Two colleges hired foundational skills instructors. These staff members teach basic skills, including study skills, and conduct some career and work readiness assessment.

- **Curriculum developers.** Three colleges hired individuals (or used grant funds to pay the salaries of existing staff members) to assist with developing new curriculum.

- **Faculty members.** The evaluation was not able to obtain accurate estimates of faculty time supported by the grant. Although most M-CAM training is being provided by permanent faculty members, in some cases colleges hired instructors specifically for M-CAM or paid credit faculty to teach noncredit courses. Macomb, for instance, hired one full-time CNC machining instructor under the grant, used the grant to pay full-time faculty members to teach noncredit courses, and contracted with a vendor (MH Technologies) which supplied faculty to teach the remaining noncredit courses. Across all of the colleges, at least 38 full-time faculty members have taught M-CAM courses. Grant funds also paid for faculty time and travel associated with attendance at M-CAM meetings and industry certification trainings (as well as tuition and fees associated with trainings).
M-CAM Staffing Challenges

All of the M-CAM colleges have faced challenges related to hiring and retaining staff members and instructors and to keeping staff members’ workloads manageable.

⇒ Hiring challenges. Due mostly to slow and bureaucratic hiring procedures, colleges were not fully staffed for M-CAM until at least a year into the grant’s period of performance. Colleges also found it challenging to recruit individuals with the right skill-sets for the positions. This was particularly the case for instructors in noncredit training programs and for job developers.

⇒ Retention challenges. Once colleges were fully staffed, they were confronted, to varying degrees, with turnover. Although only Kellogg has experienced turnover in its “M-CAM Lead” position, four colleges had turnover in the M-CAM manager position and three have had turnover in other key roles, such as the career coach. Early on in the grant, Macomb also had turnover in the Consortium Manager position, which was followed by turnover in the Consortium Lead position approximately 18 months into grant implementation. Staff turnover was problematic at colleges with smaller grants, where staff members often played multiple roles and held a substantial amount of institutional memory.

⇒ Workload challenges. Some of the staff members responsible for managing the grant found their workloads to be onerous, particularly in the first two years of the grant cycle. Although oversight of M-CAM was a relatively small part of the official job duties for college leads, for instance, it demanded a lot of their time. Grant managers, particularly at the smaller and more leanly staffed colleges, were often involved in managing the grant, providing career coaching to students, conducting employer outreach, and doing data entry. Even in the colleges that had more robust staffing, it was difficult for grant-funded staff members to keep track of “all the moving pieces” of the grant, including documenting progress and conducting the follow-up needed to document participant employment. A staff member at one college said, “We are literally talking all day long about various pieces of the grant.”

The variations in college capacity described in this chapter influenced the roll-out and implementation in numerous ways. Colleges with lower staffing capacity found it challenging to participate fully in the consortium activities described in the previous Chapter or to meet all of the grant reporting requirements.
Chapter 4: M-CAM Outreach, Enrollment, and Intake

At the point that this report was written, M-CAM had already exceeded its TAACCCT-grant enrollment goals. This chapter presents those enrollment results and describes the outreach methods used to recruit M-CAM students and the processes by which students enrolled in the M-CAM training programs. It also highlights the characteristics of M-CAM students, with attention to whether the colleges succeeded in recruiting the key target populations (such as older workers, TAA-eligible workers, and veterans). The chapter concludes with a discussion of shifts that colleges have made to their enrollment and intake processes and a discussion of challenges.

Enrollment Results

As of July 31, 2016, 3,042 students had enrolled in M-CAM. This number is 111 percent of the cumulative enrollment goal for the entire grant. The number of enrolled students will grow given that the colleges will be enrolling and serving students for another three quarters (through March 2017). Exhibit 8 highlights enrollment by college, employment status, and career pathway as of July 31, 2016.

The key findings on enrollment are as follows:

- **Five colleges have met or exceeded their enrollment targets, while the other three are approaching their targets.** Variations in enrollment reflect the varied speed with which colleges were able to get programs off the ground. Colleges that were developing entirely new programs were slower to enroll students than those that were primarily expanding or revising existing programs.

- **Overall, slightly more participants enrolled in credit programs than in noncredit programs.** Fifty-five percent of participants enrolled in credit programs and 44 percent in noncredit programs (1 percent have been enrolled in both a credit and a noncredit course). Students in the CNC Machining and Welding/Fabrication pathways are more likely than those in the Multi-Skilled Technician/Mechatronics and Production pathways to be enrolled for credit.

- **As of July 31, 2016, 50 percent of all M-CAM participants were still enrolled in M-CAM programs.** Over a third (40 percent) of all participants had completed and exited M-CAM programs, while 10 percent withdrew from M-CAM programs without completing. The student survey results show that students who withdrew did so primarily because of life conflicts, rather than because of dissatisfaction with their training. Seventy-one percent of non-completers who responded to the student survey withdrew due to life conflicts, such as a need to take care of a family member, and 84 percent of non-completers said that they were satisfied or very satisfied with their training.
Exhibit 8: M-CAM Enrollment as of June 30, 2016

Enrollment by College
Number of Participants and Percent of Enrollment Target Reached

<table>
<thead>
<tr>
<th>College</th>
<th>Participants</th>
<th>Percent of Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bay</td>
<td>148</td>
<td>74%</td>
</tr>
<tr>
<td>Grand Rapids</td>
<td>188</td>
<td>107%</td>
</tr>
<tr>
<td>Kellogg</td>
<td>608</td>
<td>101%</td>
</tr>
<tr>
<td>Lake Michigan</td>
<td>501</td>
<td>132%</td>
</tr>
<tr>
<td>Lansing</td>
<td>279</td>
<td>96%</td>
</tr>
<tr>
<td>Macomb</td>
<td>388</td>
<td>101%</td>
</tr>
<tr>
<td>Mott</td>
<td>172</td>
<td>96%</td>
</tr>
<tr>
<td>Schoolcraft</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Enrollment Target

Enrollment Status

- 1,227 (40%) Completed Program and Exited
- 1,509 (50%) Still Enrolled
- 306 (10%) Withdrew

Enrollment by Career Pathway

<table>
<thead>
<tr>
<th>Career Pathway</th>
<th>Enrolled</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNC Machining</td>
<td>775</td>
<td>65%</td>
</tr>
<tr>
<td>Multi-skilled</td>
<td>743</td>
<td>43%</td>
</tr>
<tr>
<td>Production</td>
<td>601</td>
<td>59%</td>
</tr>
<tr>
<td>Welding/Fabrication</td>
<td>902</td>
<td>39%</td>
</tr>
</tbody>
</table>

Credit

Zipcode of Residence

Number of Participants by Zipcode

- 97

1,227 (40%)
Completed Program and Exited

1,509 (50%)
Still Enrolled

306 (10%)
Withdrew
M-CAM colleges have enrolled participants from a broad catchment area that covers most of the state of Michigan. The colleges are attracting students from across Michigan, including large areas of the lower and upper peninsulas. Less than one percent of M-CAM participants have addresses outside of Michigan.

Participants are generally evenly split between the four career pathways. With 30% of all M-CAM participants, Welding/Fabrication programs enrolled the highest number of students. In comparison, Production programs served 20 percent of all enrolled M-CAM students. A small number of students (fifty-seven, or 2 percent of participants) enrolled in multiple career pathways.

Student Characteristics
The majority (60 percent) of students enrolled in M-CAM are white males. Approximately one-quarter of students are African American and less than 13 percent are female. Student focus groups and case study interviews reveal that there is substantial variation in students’ ages, employment statuses, and life experiences. Key themes are highlighted below.

There is broad variation in the age and life-experience “profile” of students. As illustrated in the sidebar, 6 in 10 M-CAM students are either over 40 or under 25 years of age. Students in these two groups typically have very different “profiles” in terms of their work experience, understanding of manufacturing trades, and life responsibilities, as noted below.

The 29 percent of participants over the age of 40 tend to perceive M-CAM as a chance to re-train in a new industry or upgrade manufacturing skills to improve employment prospects. Older participants who seek M-CAM training often have a background in manufacturing and have faced repeated layoffs. We interviewed older workers who had seen their wages stagnate or drop over the course of 15 years. These students were seeking out additional training so that they could become more competitive in the job market and support their families. Some older participants face significant life challenges,
such as having a criminal record or having experienced periodic homelessness. For example, we interviewed a 49-year-old case study student who had lived in Michigan his whole life, had weathered multiple rounds of layoffs, and had experienced significant wage losses over time. In his most recent job he was making $10 an hour less than he had made a decade previously.

In contrast, the 31 percent of participants under the age of 25 tend to see M-CAM as an alternative to pursuing a traditional four-year degree path. We interviewed a number of students in this age range who were still in an exploratory mode when it comes to choosing a career; others were looking to acquire applied skills that could get them into the workforce more quickly than a four-year degree program. Some had been exposed to the trades in high school and found that they enjoyed working with their hands. They often expressed surprise and satisfaction that they were succeeding at the community college in ways that they had not in high school.

An unexpectedly large number of participants (49 percent) are incumbent workers or were employed at the time of enrollment. The post-recession surge in employment (described in Chapter 1) resulted in higher enrollment of incumbent workers than the colleges anticipated when they applied for the TAACCCT grant. Most of these incumbent workers were looking to upskill and move into higher paying manufacturing jobs.

Almost two-thirds (62 percent) of M-CAM students came to the program with a high school degree or the equivalent but little college experience. This suggests that many M-CAM participants are new to the college environment and feel they can potentially find value in additional occupational training.

M-CAM staff and students reported that many students faced multiple life barriers and viewed M-CAM as a “second chance.” As described below and in Chapter 8, some M-CAM programs actively recruited students with criminal records or who had experienced...

I found out about the [M-CAM] program because I was underemployed. I had been working through a temp agency, Labor Ready, while I was trying to find a better job. Working there just didn’t pay enough to be able to pay the bills. So, I was looking for some type of employment that paid better.

— Student, Macomb

I always wanted to be a welder. I always liked the skilled trades. I was never really sure how I would do this, but I figured I would take a look and check out all the schools. I decided Bay was a good place to go. It’s close to home… it’s easy to get into considering my grades weren’t that great in high school.

— Student, Bay College

I had been unemployed since October 2014…. I got let go there because I was temporary. The plant… got rid of all the temporary employees. So I was unemployed since then. When I started this [M-CAM training program], my unemployment had [been] exhausted, and I was basically just surviving off what my wife was bringing in.

— Student Macomb
homelessness. Students are very appreciative of these efforts. One case study student said the M-CAM training programs at his college are “turning out a lot of good guys with my type of background especially, and finding jobs.” These students view M-CAM as an opportunity for a new start. “To get out [of jail] and do something in the community, especially going to school,” said the student just quoted, “that made me feel good.”

**Recruitment Practices**

The success of M-CAM colleges in surpassing their overall enrollment goals for the grant is particularly impressive when one considers the broader context for enrollment at each of the colleges. Overall, enrollments across all of the M-CAM colleges declined over the course of grant implementation, mainly because of the thriving economy and the demand for labor among local employers. M-CAM staff members, therefore, had to be particularly aggressive in their recruitment efforts to ensure that programs were full and that they were reaching their target enrollment goals. Staff members at one college estimated that they spent 40 percent of their time on outreach and recruitment activities.

M-CAM colleges used a variety of different strategies to recruit participants into M-CAM programs. The grant greatly increased the ability of colleges to market their programs. A staff member at Kellogg said, “M-CAM has helped to increase marketing… in industrial trade programs and occupations. The grant has put us on the map.” With the support of grant funds, all of the colleges distributed pamphlets, received referrals from partner organizations, and relied on word-of-mouth referrals. Seven of the colleges conducted presentations on M-CAM at partner organizations. Six colleges presented at their local Michigan Works! offices and six colleges advertised M-CAM programs in local newspapers. Five colleges used their websites as recruitment tools, whereas two used their college list-servs.

A number of key themes emerged from our recruitment data:

- **Colleges found that having employers participate as speakers in their orientation sessions helps with recruitment.** Although not all colleges reported success for their orientation sessions, the two colleges serving the most M-CAM students indicated that the
success of their sessions is due in part to having employers speak at the sessions about the types of jobs that students could get once they completed their training.

At least one college also found it useful for orientations to have faculty presentations, which describe the training in depth. Because many students who attend orientations have a limited understanding of what the actual training and/or job would entail, it was useful to have faculty share detailed information on training and what work in the target occupations would look like on a day to day basis.

Many referrals come from partners with which the colleges work closely. At least four colleges have strong working relationships with their Michigan Works! programs, which helped to recruit students for noncredit training programs. Other programs work closely with CBOs to assist in recruitment. Mott, for instance, works closely with Alternatives in Action, a nonprofit focused on re-entry services. Kellogg works closely with Goodwill to serve students in their EDGE program, a program designed to serve parents who are living at 200 percent of the poverty level or below.

Word of mouth is a common source of program referrals. Staff members and students at several colleges emphasized the value of word-of-mouth referrals in attracting students to the program. Program staff members “leverage former students to reach out to their family and friends” and their efforts seem to bear fruit: participants in student focus groups often said that they heard about the programs from friends or relatives. Word-of-mouth recruitment seemed to increase over time as the individual training programs developed and students were able to complete the training and successfully transition to employment. One student said the following when asked how he heard about Bay’s welding program: “It was word on the street, I guess.”

Colleges that exceeded their enrollment targets made a concerted effort to reach out to members of vulnerable populations, such as homeless persons and ex-offenders. Kellogg, for instance, conducted presentations at homeless shelters, re-entry programs, and halfway houses. College staff members at this school felt particularly passionate about reaching out to and engaging people in these populations.

Although colleges are actively seeking to bring a more diverse pool of students into the advanced manufacturing trades, the disproportionate participation of white men in the M-CAM programs suggests that there is more work to be done in outreach to underrepresented groups like women and minority racial or ethnic groups. Outreach pamphlets and other M-CAM materials intentionally feature images of diverse students, and colleges like Grand Rapids are actively reaching out to the Hispanic population by integrating English as a Second Language (ESL) support for Spanish speakers in their welding courses. Enrollment of women, Hispanics, and African Americans still remains low, however. Respondents felt that members of certain groups may be even less aware than the general population of the employment opportunities available in manufacturing. One African American student focus group participant suggested that M-CAM colleges target inner-city neighborhoods in their outreach and marketing in order to overcome a lack of awareness of opportunities in advanced manufacturing:
In our neighborhoods, we’re not talking about robotics. We’re not even really talking about welding. I’m from the inner city…. I definitely think more outreach or more advertising or marketing should be centered towards the inner city and just information about what this opportunity is about. A lot of people don’t know. I’m serious. There should have been a line wrapped around the corner to get into this [program].

— Student, Macomb

Recruitment of TAACCCT Target Populations

In addition to conducting the general outreach activities described above, M-CAM colleges made extensive efforts to recruit members of USDOL’s priority populations for the TAACCCT grants: veterans and TAA-eligible individuals. M-CAM career coaches and enrollment staff members used several strategies to recruit veterans and the eligible spouses of veterans. These included briefing local Veterans Administration staff members, making presentations at meetings of local veterans’ organizations, and attending veteran-focused events such as career fairs.

Efforts to recruit veterans have been fairly successful. Across all of the M-CAM colleges, about seven percent of enrolled participants are veterans. Although all colleges enrolled veterans, Grand Rapids and Macomb have been the most successful at reaching this population. The existence of a Veterans Affairs office on the Macomb campus and the college’s rating as a veteran-friendly school enhanced its success in enrolling veterans into M-CAM. Macomb also partnered with Cooper Standard, a private company, to provide additional grants to veterans who needed assistance with transportation, work attire, and books.

Veterans were much more likely than were all students to have some college experience and to be over the age of 40. The majority (58 percent) of veteran students were unemployed at the point of enrollment.

M-CAM colleges also worked with state and local workforce system partners to recruit TAA-eligible students. For
example, M-CAM staff members provided state and local-level TAA program coordinators with information about M-CAM and elicited guidance on how best to recruit this population. Despite ongoing outreach, however, only two percent of all M-CAM participants are TAA eligible. M-CAM staff members and local Michigan Works! staff members repeatedly commented that TAA-eligible workers are a difficult group to reach and enroll in M-CAM for a variety of reasons. Mainly, TAA certifications are down statewide, and many affected workers who were laid off from manufacturing jobs do not want to re-train for another job in the manufacturing sector. An M-CAM case manager at Lansing said this:

_We are not finding TAA people. We have not had high rapid response rates in this area and very few TAA certifications [have occurred]… We are not seeing TAA participants and even the state TAA representative is trying to figure out how to keep busy._

This observation is in keeping with the changing context for TAA workers in Michigan, highlighted in Chapter 1.

When compared to the overall group of M-CAM participants, TAA-eligible students were much more likely to be over 40 years old and not employed at the point of enrollment, and to have some college experience.

**Recruitment Challenges**

Although colleges were successful at recruiting students to their programs, they face several key contextual challenges that slow their recruitment process:

- **Many young people and their families have negative perceptions of manufacturing as a career.** One of the most commonly cited barriers to recruitment was the lack of support from high school counselors and parents. Respondents said that the boom and bust cycle of manufacturing in Michigan, coupled with an educational climate that privileges four-year degree paths, had contributed to negative perceptions of manufacturing as a viable career.

- **The low entry-level pay for manufacturing, particularly for production positions, turns off potential students.** Perhaps one reason that manufacturers in Michigan complain about a lack of qualified workers to fill available positions is that the starting hourly wage for manufacturing remains relatively low. In the region surrounding one college, starting wages hovered around minimum wage. By the middle of grant implementation, however, some faculty and M-
CAM staff reported that the low unemployment rate was putting pressure on manufacturing employers to raise wages.

Overall college enrollments are down due to a strong economy and a declining college-age population in Michigan. As expressed by some faculty members, employers are hiring anyone with a “warm body” due to the thriving local economy. Although the “warm body theory” is likely an exaggeration, enrollment in Michigan Community Colleges did decrease 18 percent between 2010 and 2014. Part of that decline can be attributed to the recovering economy and part is due to an overall decline in the high school- and college-age population in Michigan. For instance, one higher education commission predicted that the number of new college graduates in the graduating class of 2019-2020 in Flint is on track to fall 20 percent from the current level.

Dedicated recruitment staffing is inadequate. Only two of the colleges have a staff member dedicated to recruitment, which means that the career coaches and other staff members have to add recruitment to their regular job duties. As stated earlier, some staff members estimated that recruitment absorbs at least 40 percent of their time.

Procedures for Enrollment, Intake, and Assessment

One of the primary goals of M-CAM was to develop a common model for team-based intrusive intake, orientation, and assessment. Mott was the lead college for this activity; in the summer and fall of 2014, Mott worked with all of the colleges to create a common application form that could act as an Individual Development Plan (IDP) for each student. Mott also created a flow-chart that illustrated the flow of students through the intake and assessment process. In order to develop a comprehensive data-collection system for the grant that could be used to report outcomes as well as monitor grant progress, Mott, SPR, and Social Solutions Global then worked to adapt the Efforts-to-Outcomes database system to track all of the key information gathered during the intake and assessment process, as well as data on the receipt of services and outcomes for each student. In doing so, the consortium fulfilled one of its key goals, which was to create a real-time, web-based longitudinal database to track student characteristics and outcomes for reporting and evaluation purposes. As illustrated in Exhibit 9, the model enrollment and intake process for M-CAM consists of the following key steps:

Participation in an information session. Most M-CAM students participate in an information session, where grant-funded staff members share detailed information on the

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8 Social Solutions Global (SSG) is the developer of Efforts to Outcomes (ETO) case management software. SPR subcontracted with SSG to create a common ETO system for the colleges. The system’s features were developed with feedback and guidance from the colleges. SPR has managed the database functionality since the system was completed in the Fall of 2014. (non-credit0
grant, M-CAM training programs, and the job opportunities available with a college certificate or degree in one of the training areas. As stated previously, college staff members found that it is helpful to have employers participate in the information session so that they can answer student questions about career paths in M-CAM manufacturing trades.

**Determination of student’s eligibility for the M-CAM program.** Most of the colleges require that a noncredit student earn a minimum score on the Work Keys (or a similar assessment) in order to be eligible to enroll in classes. Credit students are required to reach a threshold score on the Accuplacer or Compass assessment. Noncredit students who do not reach the standard are often referred to foundational skills training, while at most colleges credit students who do not score high enough are required to complete transitional (non-credit-bearing) coursework in English and/or math. Career counselors also look for students who are (1) over 18, (2) have their high school diploma or GED, and (3) are a good fit for the program in terms of career interests and preparation.

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9 Students take the Work Keys assessments on math, reading, and locating information. Students at several colleges are awarded the National Career Readiness Certificate (NCRC) when they pass these assessments.
Completion of hard-copy or online college application form. Almost all credit students are required to submit an online college application form in addition to the M-CAM paperwork referenced below. Not all colleges, however, have online application forms for their noncredit students.

Completion of M-CAM registration packet. Forms in this packet ask the student to consent to participate in the M-CAM program and evaluation, request the student’s social security number so that wage data can be collected, and request demographic information, employment status and current wage, veteran’s status, and TAA eligibility.

Completion of Individual Development Plan (IDP). The IDP includes a range of information that the career coach or career counselor can use in providing guidance and support to the student. It initially included assessment scores, career planning, articulation of short- and long-term career goals, educational history, employment history, and barrier
assessment. As discussed further in Chapter 5, career coaches and job placement staff updated the IDP as they interacted and worked with students over time.

➤ **Assessment of barriers and obstacles.** The assessment of barriers and obstacles is an optional assessment that is used to identify issues that might influence student retention and successful completion of training. Career coaches and other M-CAM staff members use this information to identify appropriate supports.

➤ **Administration of additional tools and assessments.** Colleges also administer additional tools depending on the program. These may include a general career assessment, such as Job Fit, Career Ready 101, and Edmentum. A few programs, such as Kellogg’s production program, require that students pass a drug screen.

Although this general flow exists at all of the colleges, each college has adapted the process to fit its particular needs. It is important to note that the most significant change brought about by the grant is not the creation of a model intake and enrollment process, it is the provision of a career coach who helps students navigate the grant and college enrollment process. The career coach at Grand Rapids said this:

> We are helping students make more informed decisions and [we] have continual contact with students. Coaches have relationships with students…. Week two is freak-out week, when reality kicks in that they have to manage work, life, and school. Now we have folks there to help them navigate that dynamic.

One of the largest factors influencing the student intake and enrollment experience is whether students are interested in enrolling in credit or noncredit programs. The process outlined above is generally consistent across colleges for noncredit students, because in most cases colleges have flexible policies around the enrollment of these students. M-CAM staff members across the consortium colleges are involved in supporting noncredit students through the intake and assessments process. Almost all noncredit students, therefore, who enrolled in the manufacturing pathways created by or enhanced by the grant were formally enrolled in M-CAM.

Students interested in enrolling in credit-bearing programs, however, usually go through college-wide enrollment and intake procedures. Although most of the basic enrollment and intake steps (orientation, application, assessment) are the same, credit students usually take different assessments (e.g. Accuplacer or Compass instead of Work Keys) and work with the college admissions office to complete their enrollment in training programs. Credit students who enter M-CAM training programs through the admissions office may not meet the M-CAM staff members until after they are enrolled at the college, and thus, are not already enrolled in the M-CAM program. At some colleges, faculty or M-CAM staff members introduce M-CAM to already enrolled students as an opportunity for them to access additional supportive services and student supports, such as individualized job searches and placement assistance. See Chapter 8 for the types of student supports offered to credit and noncredit students.
Chapter 5: Development of the Foundations for M-CAM Training

M-CAM’s training programs are administered at the college level, and to a large extent the training curricula were developed independently at each college. Nevertheless, for the initiative to function as intended and realize its goals, the M-CAM training programs and pathways needed to be grounded in a common framework, and the colleges in the consortium had to coordinate their work in developing their training programs and aligning them to industry standards. Other processes common to all the training pathways also helped lay the foundation for training students in each of the pathways: new equipment was purchased at each college, and employers were engaged to provide input on curriculum development and equipment purchases and to serve as sites for work-based learning opportunities and post-training employment.

Career Pathways Model for M-CAM

SPR developed the model in Exhibit 10 to show how M-CAM’s career pathways model is designed to progressively develop the occupational, academic, and life skills that students need in order to find well-paying, stable employment.

Exhibit 10: M-CAM Career Pathways

[Diagram showing the progression of career pathways from Foundational Skills to Opportunities for well-paying, stable employment, and Opportunities for well-paying, stable employment leading to Professional, occupational, academic, and life skills]
As discussed further in Chapter 7, the model assumes that math, work readiness, and job search skills are foundational skills. Although they are represented in the model as entry-level skills, students continue to develop and revisit these skills throughout their training. Noncredit and credit production programs provide a key “on-ramp” to more specialized training in welding, CNC machining, and mechatronics. The training programs progress from short-term, often noncredit certificate programs to for-credit 1-2-year college certificate programs and AA degrees. Students’ advancement along their pathways is assisted by supportive services, the ability to earn credit for prior learning, and the ability to articulate credit between institutions. Implementation of the core features of this model are discussed in subsequent chapters—certificate and associate’s degree programs in Chapter 6, the production programs and related features to enhance pathways access in Chapter 7, and supportive services in Chapter 8.

The key components of a pathways model

- **Sector-based strategies**: connecting learners to in-demand occupations in a specific industry with explicit steps in a career ladder
- **Integrated education and training**: building basic skills and work readiness education into technical training programs and including acknowledging prior learning through work or military experience as part of the training assessment
- **Stackable and industry-recognized credentials**: Aligning curriculum with industry-recognized credentials that build on one another so that individuals can move step-wise through a career ladder in a growing industry sector and continue on a path of lifelong learning and advancement as necessary
- **Contextualized learning**: Incorporating hands-on learning, internships, and other forms of experiential learning such that the training pedagogies engage individuals and help them understand the real-world relevance of what they are learning
- **Multiple entry and exit points**: Enabling individuals to work step-wise through the tiers of a career ladder at their own pace, with the ability to leave at each point with documented skills that enhance employability
- **Supportive services**: Providing individuals with assistance in exploring career options, arranging and paying for childcare and transportation, applying for financial aid, searching for jobs, and dealing with life issues

**Curriculum Development**

To develop their training programs, the M-CAM colleges had to create new programs and courses and make enhancements to the existing training curricula in advanced manufacturing. To coordinate this process, M-CAM created a workgroup for each pathway made up of key faculty members, instructors, and staff members. The workgroups were supposed to meet according to a set schedule determined by the workgroup, usually monthly. In practice, most training area workgroups met monthly, but a few were slow to start and met on a bi-monthly basis. The goals
were to make the curricula within each pathway more consistent and employer-focused across colleges in the consortium, identify appropriate industry-credentials and enhance alignment with national industry-recognized credentials, develop technology-enabled learning strategies (e.g., hands-on learning, online coursework, online communities), and incorporate updated technology into the course content. The workgroups helped establish a more unified approach to curriculum development across colleges in Michigan, providing an institutional framework for collaboration and coordination that did not exist previously.

The five M-CAM colleges that have both credit and noncredit training programs in advanced manufacturing often piloted new noncredit courses as a way to test the new material, especially the inclusion of third-party industry certification exams, or to build the noncredit options as a feeder or introductory step into credit programs. In many cases, M-CAM fostered stronger connections between the noncredit and credit divisions of community colleges, which historically tended to operate independently and through different lines of authority. Bay, Lake Michigan, and Kellogg did not have any noncredit programs or courses in the M-CAM pathways, so the process for developing new courses and programs in those colleges was focused from the start on having faculty develop new curricula and then getting the necessary approvals.

The administrative processes for approving new courses and programs varied a great deal across the M-CAM consortium, given the differences in size, institutional structures, and funding mechanisms. In general, the approval process for new courses and new programs was lengthy—often taking more than a year for final approval. Typically, the approval process included approval from the dean, the registrar, and a curriculum committee, although in some colleges there were additional layers of approval.

**Role of Faculty Members**

In most cases, the colleges assigned specific faculty members to the task of creating and designing new courses and curricula. Although substitutes were hired so that faculty members could participate in consortia meetings, faculty members were generally expected to develop curricula while also continuing with their regular teaching duties. This placed a considerable time burden on faculty members, which they said reduced their ability to participate consistently in workgroup calls and caused delays for some workgroup activities. For example, the college president at Kellogg explicitly made the recommendation that if they were to implement the grant over again, he would make sure that the assigned faculty had teaching releases in order to concentrate their efforts on curriculum development and enhancement activities.

Despite the constraints on their time that faculty consistently reported, several said that the workgroup meetings benefited them personally more than any other aspect of M-CAM. They felt...
that the meetings provided an opportunity for the faculty members to learn from each other, gauge how much work the curriculum needed to be on par with that of the other colleges, and build lasting relationships for further knowledge exchange.

In order to continue the dialogues supported through these in-person meetings, M-CAM launched online learning communities for each of the pathways in late spring 2016, with plans to pilot with faculty members in fall 2016. The M-CAM online learning community works like any other social media site, with individual profiles, discussion posts, shared files, a directory, and the ability to ask questions and receive feedback. (See Appendix B for more detail on the design and early implementation of the online learning community.)

In addition to supporting their direct work on the curriculum, the M-CAM grant funded faculty to become certified instructors for several nationally recognized industry credentials. The evaluation has incomplete information on faculty certifications, but we know that at least 6 faculty members have been certified in NIMS, 8 in PMMI, 4 in FANUC, 8 in Siemens, and 8 in MSSC. Most colleges had at least one faculty member certified in AWS prior to the launch of the grant, and at least one college (Schoolcraft) became an Authorized Testing Center (ATF) for AWS during the grant. The certification of instructors has enhanced the ability of faculty members to align the new courses and programs with stackable credentials and offer testing to students so that they can become certified. It has also helped to build buy-in from faculty on the value of industry credentials.

**Equipment Enhancements**

Equipment purchases went hand-in-hand with the development of new and enhanced curricula. New equipment was needed to increase the availability of hands-on, experiential learning for students and to bring the training into alignment with the types of equipment and newest technologies used by industry partners. Colleges spent the early phases of the grant consulting with employer partners and faculty about what equipment to purchase, and the middle and the later phases of the grant installing equipment and incorporating it into the curriculum. We provide an overview of equipment purchases in this section and go into more detail about the specific equipment that was purchased within the discussion of each industry pathway in Chapter 6.
A number of key findings can be derived from the data presented in Exhibits 11 and 12:

**Equipment expenditures ranged from a high of $978,186 (at Kellogg) to a low of $267,480 (Schoolcraft).** This represented a tremendous infusion of new equipment for colleges, a number of which had limited opportunities to invest in equipment prior to the TAACCCT grant.

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10 At the time of the third site visit, Schoolcraft College had an outstanding request to purchase additional Multi-Skill Technician/Mechatronics equipment. That costs for that equipment are not included in this analysis.
Bay spent the largest proportion (50 percent) of its grant funds on equipment, while Macomb spent the lowest proportion (8 percent). Equipment purchases accounted for 65 percent of Bay’s total grant expenditures through the end of May 2016. The high investments in equipment may be one reason that Bay was not able to hire more staff members to assist with grant implementation. Given that Macomb dedicated nearly half of its grant to supporting consortium-wide activities, it is not surprising that a lower proportion of its total grant was dedicated to equipment purchases.

The majority of colleges spent between 20 and 40 percent of their grant amounts on equipment purchases. This allowed the colleges to dedicate the remaining 60–80 percent of their grant funds to personnel costs, professional development, recruitment and outreach, and material costs key to grant implementation.

Much of the equipment purchased by colleges was used to strengthen the mechatronics/multi-skill pathway. Nearly half of the equipment purchased (75 of 159 items) was to support the development of the mechatronics pathway. Colleges spent $2.1 million on mechatronics equipment, which is 42 percent of all equipment expenditures. Mechatronics equipment included Process Logic Controllers (PLCs), robotic equipment, and fluid power and hydraulics systems. It also included electronic systems and software that mimic assembly line processes.

Welding equipment was the second largest area of investment. Colleges spent $1.7 million dollars on welding equipment, which is 34 percent of equipment expenditures. Bay and Grand Rapids invested the most heavily in welding equipment, purchasing MIG welders, TIG welders, welding booths, and robotic welding cells. Several colleges also purchased welding simulators and virtual welders.

With the exception of production, the least amount of funding was directed towards purchasing CNC machining equipment. Colleges spent just over $1 million on CNC equipment. Commonly purchased equipment included lathes, milling machines, and 3-D printers.

There were no official equipment purchases for the production pathway. Colleges did purchase supplies and materials for production pathways, but purchases were under the threshold of what is considered a “formal” equipment purchase, which is around $5000.

[The welding program has] definitely taken on a different view [due to the new equipment], I would say, in the public eye...You start seeing these guys who are clean and dressed nice, and they’re welding and working with robots and simulators and all this different nice equipment...

Walking into a clean building—even if you’re just coming to check out the welding program, it just changes your connotation. You start thinking, “Well, geez, this isn’t what I picture an old dirty ship builder to be. You know, I can get in here and stay clean, and make a lot of money and get a good job.”

— Faculty Member, Bay College
In addition to using the M-CAM grant to purchase equipment, many colleges leveraged additional funding from the state of Michigan to buy additional equipment. The governor of Michigan created the Community College Skilled Trades Equipment Program (CCSTEP) grant in 2015, which provided multi-million dollar grants to help modernize Michigan’s educational programs in manufacturing. These funds were also used by at least three colleges (Kellogg, Lansing, and Bay) to upgrade their facilities. For instance, Bay purchased equipment from M-CAM and leveraged other funding sources to develop a new welding center on its west campus in September, 2015. The main campus in Escanaba also doubled the size of its training cohorts through a combination of additional equipment, space, and materials labs.

M-CAM consortium faculty members, students, and staff members across colleges generally felt that the ability to use M-CAM to upgrade equipment was extremely valuable for ensuring that the colleges could stay up-to-date and train students on the latest technology. Upgrading equipment, therefore, not only facilitated the training itself, but also helped the colleges market manufacturing careers to younger generations and push aside impressions of manufacturing as an outdated, dead-end sector.

Ribbon Cutting for New Welding Center on the Bay College Website

Employer Engagement

The colleges all had employer relationships prior to M-CAM, but the M-CAM grant required that they reconnect with their employer base and strengthen those relationships. M-CAM staff and faculty members worked with employers to inform all aspects of the implementation of the pathways model, particularly alignment of curricula with industry practices, standards, and credentials, and development of employment and work-based learning opportunities. In this
process, the career coaches and job development staff members were instrumental in helping colleges reach out to employers and increase their participation, particularly in job placement-related activities. SPR gathered detailed information on the number and quality of employer partnerships, with core findings highlighted below:

→ **Across the consortium, the number of reported employer partnerships nearly doubled, from 204 in Fall 2014 to 392 in Spring 2016.** Six of eight consortium members reported growth in the number of employer partners, with Bay, Lake Michigan, Macomb, and Schoolcraft reporting the most growth. Most new partners were engaged in assisting with job placement.

→ **300 employers across eight colleges (77 percent of total employer partners) were engaged in planning for and developing training programs.** This was a common role for employers to play prior to the grant, but colleges were able to increase the pool of employers that they were working with. At the time of the Spring 2016 site visit, 70 percent of the programs in the pathways at each college (18 out of 26) were actively working with industry representatives to ensure that course content met their needs. Employers also responded to surveys from some pathway working groups. Through those mechanisms, the colleges gathered input on decisions such as which certifications to select and align coursework to and what equipment to purchase.

→ **158 employers across seven colleges (38 percent of total employer partners) were engaged in helping to recruit students into the M-CAM program.** Although this was the area of least involvement for employers, it is notable that nearly a third (28%) of all employers offer tuition assistance to M-CAM employee students. Employers also referred employees to the colleges for training and participated in orientation sessions to educate students on what kind of jobs they would be eligible for if they completed training.

→ **278 employers across the eight colleges (71 percent of total employer partners) were directly engaged in enhancing training quality.** These employers provided job site tours to students, served as guest speakers in classes, provided job shadowing opportunities, provided mock or practice interviews for students, and critiqued student resumes. Many colleges also worked
very closely with employers to provide customized trainings and incumbent worker training classes or programs.

356 employers across the colleges (91 percent of total employer partners) assisted with job placement for students. These employers interviewed participants at the college, participated in job fairs, and actively coordinated with M-CAM staff members to hire students. Two of the most common roles were posting job listings (75 percent) and coordinating with M-CAM job developers to hire students (50 percent).

Growth in employer partnerships over the life of the grant speaks to the consortium’s deliberate efforts to actively engage employers in strengthening their career pathways, from the design phase through job placement. They engaged at least 188 new employers whom they had previously not worked with and leveraged those connections in meaningful ways. Furthermore, over 60 percent of employers played five or more roles, reflecting a deep level of engagement with the colleges.

**Student Perspectives on Training Quality**

Finally, before heading into Chapters 6-7, which provide specifics on each pathway, it is important to share overarching feedback on training quality. Students who responded to the exit survey for M-CAM, which was administered to students after completion or withdrawal (non-completers), were overwhelmingly satisfied with their training and the quality of instruction.

- Ninety percent of the 337 students who responded to the question on training quality said that they were satisfied or very satisfied with the training they had received. There were no significant differences by colleges and the satisfaction levels were also very consistent across the career pathways, ranging from 88 percent in machining to 92 percent in production.
- Credit students who responded to the survey were more satisfied with training and instruction than non-credit students. 94 percent of credit students reported being satisfied, while 88 percent of non-credit students felt the same.
- Students who completed their programs generally felt that training helped them get their most recent job, although there was a significant difference between credit and non-credit students. Eighty-two percent of credit students felt that their training had helped them attain their current job, while only 67 percent of noncredit students felt that way. Noncredit production programs were the least likely to be perceived as being helpful, as only 47 percent of the 24 non-credit production students that responded to the survey indicated that training had helped them to get their current job. That is perhaps not surprising given that noncredit production programs are generally light touch programs providing an orientation to advanced manufacturing.

Students who participated in the case study interviews and focus groups provided some more in-depth feedback on the quality of their instructors and their training. Their perspectives are integrated into chapters 6 and 7. In general, aside from some of the foundational skills training
that they received, students felt that the quality of their instructors was very high, and they were pleased with how instructors brought their knowledge from working in industry into the classroom. Many students commented on how a particular instructor broadened their perspective and opened their eyes to the value of going to school. This feedback and praise was fully consistent with the survey results.
Chapter 6: Core Training Programs

M-CAM promoted important changes and improvements in the three core advanced manufacturing pathways: welding, machining, and multi-skill/mechatronics. In each pathway, colleges created new training programs for noncredit and credit students and enhanced existing noncredit and credit programs by adding new equipment, developing new courses, and aligning curricula with industry certification systems. In this Chapter, we describe these programmatic changes, assess improvements in hands-on learning, and present the opinions about the programs that students shared in their focus groups and case study interviews.

Welding

Training in welding has a long tradition in most of the M-CAM colleges, a direct legacy of the demand from employers in automobile manufacturing and similar industries for workers with this skill. However, at the start of the M-CAM TAACCCT grant, the content of the welding curricula varied a great deal across colleges and, in most colleges, the equipment was very old and the incorporation of AWS certifications uneven. While some schools, such as Grand Rapids, had a very robust Welding program in place, with many options for specialization and advanced coursework, other colleges had more limited offerings when M-CAM started.

Therefore, the welding work group in M-CAM sought to accomplish three main goals: make the learning objectives more consistent across colleges, improve the integration of AWS credentials, and update equipment. The welding curriculum itself did not require many changes. The main exception—to adapt to the increased use of robotics within the welding profession—was the addition of robotic welding courses and course content. At least three colleges have made substantial enhancements to their curricula in the area of robotic welding.

Faculty generally found the welding work group valuable for improving coordination across colleges and building relationships with faculty from other colleges. Compared to faculty in the other pathways, welding faculty members were more reluctant to change the existing training curricula in their pathway because they felt that the programs had been honed over a long period of time and still had a high level of employer demand. In short, they did not see a need to fix what was not broken. This explains why much of the focus was on updating equipment and building capacity to serve more students, rather than creating new courses and programs. There were

M-CAM, with other community colleges, finally put together the right people to sit down and talk about welding in order to expand our footprint in welding right across the middle of the state. And hopefully, we can pick up those manufacturers and get input and foster that input with the community across the middle of the state. That’s important. I think that’s probably one of the most important things we’ve been able to do. We’ve succeeded in that when you say with the term welding, it’s not just welding here at this Community College, it’s welding all the way across the center of the state.

— Faculty Member, Mott
differing opinions among faculty about the value of AWS certifications and whether to adopt AWS for both for-credit and noncredit programs. However, even though the incorporation of AWS certification was contentious among some faculty at first, as the M-CAM initiative evolved, it appeared that most faculty began to view the AWS certifications more positively, due to the benefits it could have for students in terms of getting a job interview or finding employment in a new location.

**Noncredit Training Programs**

Three colleges implemented new noncredit programs in Welding (Exhibit 14). Generally speaking, the new noncredit basic welding courses were designed to provide students with an introduction to welding that could be the basis for entry into more specialized credit-based programs or apprenticeship programs in Welding.

As feeder programs, most of these new noncredit programs enable students to obtain credit for the coursework if they transfer to a credit-based program after completion. Grand Rapids, which already had a noncredit basics course in welding, added a new noncredit course in Robotics Welding. They purchased new robotics welders for that course using M-CAM funds.

### Exhibit 13: New Noncredit Welding Programs

<table>
<thead>
<tr>
<th>College</th>
<th>Program</th>
<th>Credential(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grand Rapids</td>
<td>Robotics Welding</td>
<td>Certificate of completion</td>
</tr>
<tr>
<td>Lansing</td>
<td>Exploratory Welding</td>
<td>Certificate of completion Forklift certification</td>
</tr>
<tr>
<td>Lansing</td>
<td>Welding basics</td>
<td>Certificate of completion</td>
</tr>
<tr>
<td>Schoolcraft</td>
<td>Welding boot camp</td>
<td>Certificate of completion AWS OSHA 30</td>
</tr>
</tbody>
</table>

In addition to establishing new noncredit programs, many colleges also offered new noncredit customized training or incumbent worker training programs in Welding on an as-needed basis. For example, as of April 2016, Lansing had offered four cohorts of a GM welding certification, and students in those programs took the GMAWS certification exams. Similarly, Kellogg has provided company-sponsored trainings in welding to 60 students to date, based on ETO enrollment data.

Four colleges enhanced their existing noncredit Welding offerings (Exhibit 15). The most common enhancement was the addition of AWS Level 1 certification, which typically meant that M-CAM has provided an entry-level program that serves as a good feeder into our credit-based welding programs. We had a student that never touched a weld piece of equipment, and now because of going through the basic weld program he was accepted into the pipe fitters union and he is doing so much with the welding trade.

– Faculty Member, Lansing
funded at least one faculty member to become AWS certified. With the AWS-certified instructor on board, the college could test and certify students. At least one of the schools also put articulation agreements in place to enable students to get credit for noncredit coursework if they decide to pursue further academic work in a for-credit Welding program.

**Exhibit 14: Enhanced Noncredit Welding Programs**

<table>
<thead>
<tr>
<th>College</th>
<th>Program</th>
<th>Credential(s)</th>
<th>Enhancements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grand Rapids</td>
<td>Welding fabrication</td>
<td>Certificate of completion AWS</td>
<td>Added AWS</td>
</tr>
<tr>
<td>Lansing</td>
<td>Welding fabrication</td>
<td>Certificate of completion AWS</td>
<td>Added AWS</td>
</tr>
<tr>
<td>Macomb</td>
<td>Welding fundamentals</td>
<td>Certificate of completion AWS</td>
<td>Added AWS testing</td>
</tr>
<tr>
<td>Mott</td>
<td>Welding</td>
<td>Certificate of completion AWS</td>
<td>Articulation to credit</td>
</tr>
</tbody>
</table>

Overall the changes to noncredit curricula in welding have not been substantial, and the most common change was adding AWS certification in colleges where it was not in place already. The colleges also increased the number of entry-level welding options by creating some new noncredit offerings to introduce more people to the field and to meet employer needs for customized training.

**For-Credit Training Programs**

Only two colleges created new Welding credit-based programs as part of M-CAM, which is not surprising given that Welding was already well established in most of the M-CAM colleges. The new programs include one associate’s degree program and two new college certificate programs in Welding (Exhibit 16).

**Exhibit 15: New For-Credit Welding Programs**

<table>
<thead>
<tr>
<th>College</th>
<th>Program</th>
<th>Credits</th>
<th>Credential(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lake Michigan</td>
<td>Welding Production Technology</td>
<td>61</td>
<td>Associate of Applied Science AWS</td>
</tr>
<tr>
<td>Lake Michigan</td>
<td>Welding Production Technology</td>
<td>17</td>
<td>Certificate of completion AWS</td>
</tr>
<tr>
<td>Schoolcraft</td>
<td>Welding Pre-Apprenticeship</td>
<td>24</td>
<td>Certificate of completion AWS OSHA 30</td>
</tr>
</tbody>
</table>

M-CAM colleges enhanced many of their existing for-credit Welding programs (Exhibit 17). The most common enhancements were to add AWS certification and new equipment. Some schools added new courses, such as Robotic Welding, and online learning modules. Schoolcraft added a
welding internship class as an option for students in the associate degree program and a new pre-apprenticeship certification to both the certificate program and the degree program. This pre-apprenticeship certificate allows completers to enter the local Ironworker’s Union.

**Exhibit 16: Enhanced For-Credit Welding Programs**

<table>
<thead>
<tr>
<th>College</th>
<th>Program</th>
<th>Credential(s)</th>
<th>Enhancements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bay</td>
<td>Welding</td>
<td>Certificate of completion AWS</td>
<td>Doubled capacity</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Added equipment</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>New welding center</td>
</tr>
<tr>
<td>Grand Rapids</td>
<td>Welding</td>
<td>Associate of Applied Science AWS</td>
<td>New robotic welding classes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Added equipment</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Added AWS</td>
</tr>
<tr>
<td>Grand Rapids</td>
<td>Welding</td>
<td>Certificate of completion AWS</td>
<td>New robotic welding classes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Added equipment</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Added AWS</td>
</tr>
<tr>
<td>Kellogg</td>
<td>Industrial Welding</td>
<td>Associate of Applied Science AWS</td>
<td>Upgraded curriculum</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Added equipment</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Online learning (Moodle)</td>
</tr>
<tr>
<td>Kellogg</td>
<td>Industrial Welding</td>
<td>Certificate AWS</td>
<td>Upgraded curriculum</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Added equipment</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Online learning (Moodle)</td>
</tr>
<tr>
<td>Lansing</td>
<td>Welding</td>
<td>Associate of Applied Science</td>
<td>Added AWS SENSE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Added equipment</td>
</tr>
<tr>
<td>Lansing</td>
<td>Welding</td>
<td>Certificate of Achievement</td>
<td>Added AWS SENSE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Added equipment</td>
</tr>
<tr>
<td>Lansing</td>
<td>Welding</td>
<td>Certificate of Completion</td>
<td>Added AWS SENSE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Added equipment</td>
</tr>
<tr>
<td>Schoolcraft</td>
<td>Joining Technology</td>
<td>Associate of Applied Science AWS OSHA 30</td>
<td>Added AWS</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Added pre-apprenticeship welding certification (WELD 225)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>New internship option</td>
</tr>
<tr>
<td>Schoolcraft</td>
<td>Welding Fabrication</td>
<td>Certificate of Completion AWS WELD 225</td>
<td>Added AWS</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Added pre-apprenticeship welding certification (WELD 225)</td>
</tr>
</tbody>
</table>
Enhancements to Equipment and Facilities

Many of the M-CAM colleges used the TAACCCT grant funds to purchase new welding equipment. Bay college focused most of its TAACCCT grand funds on welding equipment purchases, which had a dramatic effect on the size of each cohort (it doubled the size of the program). Program managers reported that the new equipment also began to change local perceptions of Welding as a field, because the new equipment is not as dirty or polluting as the older equipment.

Grand Rapids is one of three colleges that used its equipment allocation to acquire new robotic welders and virtual welders, which represent the cutting edge of welding practices in the industry. Grand Rapids discovered that the virtual welders save on materials costs, because introductory students don’t need to practice with real materials. Once these students get the hang of basic welding techniques, they can practice with real welders. The virtual welding simulators are also helping the colleges attract students into Welding as a field.

Examples of Welding Equipment Purchased by MCAM Colleges

Bay College added new welding booths, MIG welders, and TIG welders, which enabled them to double the size of each Welding cohort. The new booths also improve indoor air quality, because they ventilate pollutants outside.

Grand Rapids, Lansing, Mott, and Kellogg purchased virtual welders. Faculty at Grand Rapids said that having the virtual welders helped promote the program among prospective students and reduced materials costs because they were used to teach introductory welding.

The program has opened doors for me because of the different types of technology I’ve learned to use in welding. A lot of the machines are really new and have a lot of features on them that really help you find the right settings that we didn’t have during the apprenticeship. So I thought that was kind of neat how the new machines are really helpful now.

— Student, Bay College
Even small purchases in equipment can go a long way. For example, at Mott several students had complained during the initial site visit focus groups about the old welding hoods that they were given, saying that they made it very hard to see. In the most recent round of site visits, a faculty member announced that the college had purchased new, automatic change hoods that were much easier to use:

We bought some hoods; that was a very nice addition. It was very helpful in M-CAM. We could condense a timeline of almost two weeks down to almost three or four days in abilities to pick up and work with a hood, which is an automatic change hood for welding, as opposed to the old standard hood.

Some staff members have reported that these grant-funded program improvements in equipment have helped to change the perception of Welding in Michigan from a dirty and outdated occupation to one that shows promise for job growth, decent wages, and more technologically sophisticated career ladders.

**Hands-on Learning**

Training in welding requires a great deal of hands-on learning, and generally the Welding programs were already set up to provide this before M-CAM. Hands-on learning is also important to students, and they generally praised the hands-on quality of their welding classes.

**Hands-on Learning Opportunities in Welding**

All of the Welding programs at M-CAM colleges reported high use of hands-on learning due to the nature of the field. This photo from Lake Michigan shows hands-on learning in one of the new credit-based Welding programs at that college. Lake Michigan hired a new AWS certified instructor in welding in order to be able to expand the credit-based offerings in the pathway.
At the same time, a handful of students felt that there was not enough opportunity for hands-on instruction. This appeared to be the result of high student-to-teacher ratios in some classes. Students in those classes felt that their teachers did not have time to check in with each student and make sure they were progressing within a reasonable time frame.

**Student Perspectives**

Consistent with the exit survey results presented in Chapter 5, most of the students had very positive feedback about their Welding program training experience. There were even a handful of students who expressed that being part of the Welding training program has had a significant impact on their identity, ambitions, and sense of what is possible for them to achieve. The following samples represent these narratives of students’ personal transformations:

- [The welding program has] really opened up my eyes to what I really can do and where I’m setting my goals at… I haven’t missed a day. My heart’s been in there.
  
  – Student, Mott

- I started off welding on my own and learning from an apprentice, so you only get the bare minimum. [The welding program] has completely opened the door to all the different kinds of technology and experience….It was just a lot to take in.

  – Student, Bay

- To be honest, I had not considered any training or school. This program has opened all that. This class did so much for me and [this college] has done so much for me that literally…it has opened up a whole new door for me.

  – Student, Lansing

- Welding is up-and-coming. We’ve had a chance to go and find out the job market…[Welders] make good money. It’s a good field. It’s a very good skill…I want to say thank you for the opportunity you all have given me just to be in the class.

  – Student, Mott

Many of the students also commented on the high quality of their Welding teachers. Across all M-CAM colleges, students felt that Welding faculty members brought a lot of real-world experience to their jobs; not only were they “masters” at the trade, but also they knew how to teach the material to others.

- And the way [the welding instructors] teach, they teach way different than any other instructor I’ve had [here]….They’re actually pretty much like your bosses that you [work with] in the field.

  – Student, Bay
[The instructor] would tell us little things that helped her out and said it may or may not work for you, but she shared it with us. I remember one thing she said is that welding is like finding your center and your rhythm. She was like Yoda. She taught us every little trick.

- Student, Lansing

Students also expressed some criticisms of their Welding programs. The most common complaint was that the program was too short or that the pace was too quick for them to get fully prepared for the certification test. Some students remarked that a lack of extra catch-up time in the lab hampered their progress; others said that a lack of one-on-one time with instructors slowed some students down. In one Welding program, many of the students who started the noncredit Welding program were no longer in the program by the end, signaling that the course wasn’t providing the resources or support that most of the students needed to succeed.

Finally, some students expressed a desire to have more orientation to what a job would be like within the Welding field. For example, a case study student in Welding who came to the program directly from high school said that even though he liked his training, he was anxious about applying for jobs because he was not sure what they would entail or what the workplaces would be like. Satisfying this need is especially relevant for younger students who have less work experience.

**CNC Machining**

Machining, like Welding, has a long history at many of the M-CAM colleges due to its importance in the automotive and food processing industries. However, until recently many machining programs in Michigan had been scaled back or even eliminated due to low demand. The emergence of computer numeric control (CNC) machining, or automated machining, combined with the impending retirement of a large wave of highly skilled machinists has started to reignite demand for training in machining. In CNC machining, tools and parts are designed with computer assisted drawing (CAD) and other imaging software, and then machines such as CNC lathes, CNC mills, or 3-D printers are then used to fabricate the tools or parts from raw material.

The main focus of the M-CAM faculty work group in machining was on aligning curricula with NIMS certifications. However, faculty members had mixed reactions to the push to adopt NIMS certifications. Some faculty members felt that NIMS was sub-standard and in need of updating, so there was a lot of reluctance at first to align curricula with NIMS. As one informant said, “There are some real hot spots for NIMS across the country, but Michigan is not one of them.” However, by the third-round
site visit, some of the faculty members who originally had reservations had come to see more value in NIMS.

Schoolcraft was the lead for the industry working group in machining, and faculty members from Macomb and Grand Rapids were engaged in aligning curricula with NIMS. More recently, Mott has become more involved with the addition of a new full-time machining instructor in fall 2015. Neither Bay nor Lansing included machining in their M-CAM activities. As a direct result of M-CAM, Schoolcraft is in the process of becoming a NIMS certification testing center, which was a significant enhancement for the college.

**Machining Instruction at Schoolcraft**

Schoolcraft machining instructor, Gene Keyes, uses a blueprint to explain to a student how the tool cuts the part.

**Noncredit Training Programs**

Only two colleges, Schoolcraft and Grand Rapids, created new noncredit programs in CNC machining (See Exhibit 18). Grand Rapids created a new CNC Precision Machining Certificate program that is an 18-week-long job-training program of 32 hours of instruction per week. Students can earn 3 NIMS certifications, OSHA 10 certification, and First Aid/CPR certification. Students can articulate 13 credits into a one-year credit certificate program or AAS degree at Grand Rapids, and at least three students had done this at the time of the third site visit, according to faculty.

Schoolcraft developed a new 11-week noncredit CNC operator training program, which was originally developed for an employer, Loc Performance. It was first run in the summer of 2015 and included OSHA 30 certification and opportunities to get certified in NIMS Level 1. After completion, students could participate in interviews with the employer. The advertisements for the program listed a starting wage of $10–14 per hour in the Detroit metro area. At the time of the round-3 site visits, this course was still running and the instructor was hoping to add two quality
control-related classes to the program (speeds and feeds, and computerized measuring machine, or CMM).

**Exhibit 17: New Noncredit CNC Machining Programs**

<table>
<thead>
<tr>
<th>College</th>
<th>Program</th>
<th>Credential(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grand Rapids</td>
<td>CNC Apprenticeship Program (Autocam)</td>
<td>Certificate of completion</td>
</tr>
<tr>
<td>Grand Rapids</td>
<td>CNC Precision Machining</td>
<td>Certificate of completion NIMS OSHA 10 First Aid/CPR</td>
</tr>
<tr>
<td>Schoolcraft</td>
<td>CNC Operator Boot Camp</td>
<td>Certificate of completion NIMS OSHA 30</td>
</tr>
</tbody>
</table>

Grand Rapids, Macomb, and Mott enhanced their existing noncredit CNC machining programs (Exhibit 19). Each college added new equipment and NIMS certification options. Grand Rapids added work-based learning opportunities. At Mott, the new machining instructor added a new precision machining component and the related equipment, although he said that there was still a need for more lathes to increase hands-on time.

**Exhibit 18: Enhanced Noncredit CNC Machining Programs**

<table>
<thead>
<tr>
<th>College</th>
<th>Program</th>
<th>Credential(s)</th>
<th>Enhancements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grand Rapids</td>
<td>CNC Technician Job Training Program</td>
<td>Certificate of completion NIMS</td>
<td>Added NIMS New work-based learning opportunities Added equipment</td>
</tr>
<tr>
<td>Macomb</td>
<td>CNC Program</td>
<td>Certificate of completion NIMS</td>
<td>Added NIMS Added equipment</td>
</tr>
<tr>
<td>Mott</td>
<td>Machinist Training Program</td>
<td>Certificate of completion NIMS OSHA 30</td>
<td>Added NIMS New precision machining component Added equipment</td>
</tr>
</tbody>
</table>

**For-Credit Training Programs**

None of the M-CAM colleges created new credit-based programs in machining, which is most likely explained by the long tradition of having machining programs already in place at most of the colleges. However, several of the colleges made enhancements to existing for-credit programs and courses (see Exhibit 20). The enhancements generally served to update the curricula and make them more consistent across colleges. Kellogg, Lake Michigan, and Macomb added online learning components, such as Tooling U. Schoolcraft also added a for-credit internship course to its associate degree program, which provided new work-based learning opportunities for students.
In fall 2015, Mott hired a new machining instructor who focused his first-year efforts on updating course content and format. He sought to make the courses more hands-on and to add more depth to the course offerings. The two courses that this instructor planned to add for fall 2016 were both second-level classes for the Machine Tool Technology program: Advanced CNC Setup, Programming, and Operation; and Advanced Machining for Tooling and Repair. Both he and a faculty member at Kellogg anticipate a need to enhance the tool and die components of their machining curriculum in order to meet growing employer demand.

**Exhibit 19: Enhanced For-Credit Machining Programs**

<table>
<thead>
<tr>
<th>College</th>
<th>Program</th>
<th>Credential(s)</th>
<th>Enhancements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kellogg</td>
<td>Industrial Machining Technology</td>
<td>Associate of Applied Sciences NIMS</td>
<td>Upgraded curriculum, Added equipment, New online learning options (Moodle)</td>
</tr>
<tr>
<td>Kellogg</td>
<td>Industrial Machining Technology</td>
<td>Certificate NIMS</td>
<td>Upgraded curriculum, Added equipment, New online learning options (Moodle)</td>
</tr>
<tr>
<td>Lake Michigan</td>
<td>Machine Tool Technology</td>
<td>Associate of Applied Sciences NIMS</td>
<td>Added equipment, Added Tooling U</td>
</tr>
<tr>
<td>Lake Michigan</td>
<td>Machine Tool Technology</td>
<td>Certificate NIMS</td>
<td>Added equipment, Added Tooling U</td>
</tr>
<tr>
<td>Macomb</td>
<td>Applied Technology Advanced Processes Program</td>
<td>Certificate NIMS</td>
<td>Added NIMS, Added Tooling U access</td>
</tr>
<tr>
<td>Mott</td>
<td>Mechanical Operations Technology</td>
<td>Associate Degree NIMS</td>
<td>Added NIMS, Added equipment</td>
</tr>
<tr>
<td>Mott</td>
<td>Machine Tool Technology</td>
<td>Certificate NIMS</td>
<td>Added NIMS, Updated curriculum, Added equipment</td>
</tr>
<tr>
<td>Schoolcraft</td>
<td>Advanced Manufacturing</td>
<td>Associate of Applied Science NIMS</td>
<td>Added NIMS, New internship option, Upgraded curriculum</td>
</tr>
<tr>
<td>Schoolcraft</td>
<td>Advanced Manufacturing</td>
<td>Certificate NIMS</td>
<td>Added NIMS, Upgraded curriculum</td>
</tr>
<tr>
<td>Schoolcraft</td>
<td>Advanced Manufacturing Skills</td>
<td>Certificate NIMS</td>
<td>Added NIMS, Upgraded curriculum</td>
</tr>
</tbody>
</table>
Enhancements to Equipment, Facilities, and Hands-On Learning

Although none of the M-CAM colleges made any major expenditures on machining equipment for M-CAM, several colleges made some upgrades to their machining equipment by, for example, purchasing new CNC lathes, CNC mills, and 3-D printers. At Grand Rapids, faculty members reported that it had been 20 years since the college was able to upgrade its machining equipment, so the new equipment helped improve the image of the program and enhanced the ability of instructors to offer hands-on instruction. Schoolcraft created a new machining lab and was in the process of becoming a certified NIMS testing center, which included the purchase of 17 computers and equipment to support MasterCam and other online CNC software.

Examples of Machining Equipment Purchased by MCAM Colleges

Mott, Kellogg, and Lake Michigan purchased CNC lathes to train students on how to transform raw material into tools and parts.

Mott and Kellogg purchased 3-D printers for their fabrication labs in CNC machining. The 3-D printers were used to design and produce tools and other sample parts.

Machining is generally a very hands-on-oriented pathway. At Kellogg, the machining program is hands-on—using real-world equipment—and modular, with some portions of the classes available online for completion. The modules are pass/fail, so a student can work on a module until he or she passes it. Students also receive one-on-one instruction from a journeyman instructor.
Student Perspectives

Student participants from the CNC machining pathway generally had positive feedback about their training. Students perceived the equipment and hands-on instruction components of the programs to be the most valuable aspects of training. For example, one student said that he was drawn to the program in part because of the equipment and the opportunity to learn how to use automated machining technologies:

[My current employer] is very old-school. The machines are very old. But I knew a lot of the companies in the area were going to computerized robotics.... And I knew if I was going to be able to hang on to my job, I better learn those computerized machines and how to program them and how to run them and how to keep them going. And having the CNC machines here and being trained with them (and the CNC lathes and the CNC machining centers), I knew was going to be beneficial for me. Because my job is starting – the company where I work is starting to upgrade their machines to be more automatic machines instead of manual ones.... So it is very beneficial for me to be able to have the hands-on and work with the machines here and learn them.

– Student, Lake Michigan

The students also praised the instructors, commenting on their ability to have the content build on itself over time and how they drew from previous industry experience. Students saw the instructors as very knowledgeable and hands-on. Students at Kellogg, which has a modularized curriculum in machining, also commented on how the self-pacing is helpful for giving students the flexibility they need to fit the program around their existing obligations. The students in the modularized curriculum did share the caveat, however, that self-pacing is challenging for students who need more encouragement and structure.

Multi-Skilled Technician / Mechatronics

The multi-skilled technician/mechatronics pathway is different from Welding and CNC Machining in that it is a much more recent field of specialization within advanced manufacturing. In fact, it is so recent that there is still some disagreement about what to call it. Several M-CAM colleges prefer the term “mechatronics,” because, as one faculty member said, the term multi-skill is vague and lacks name recognition, and millennials think mechatronics “sounds more cool.” Over time, the term mechatronics appears to be growing in favor among consortium colleges. In this section, we will use “multi-skilled technician/mechatronics” unless a particular college is using a specific term to refer to its training program.

When you graduate with our two-year degree in mechatronics, this is not our number, this is from the state of Michigan, the average salary after two years – so this is two years out of high school, is $56,000.00.

– Faculty, Grand Rapids
The multi-skilled technician/mechatronics pathway covers a combination of several skill areas (hence the term multi-skill), including electronics, mechanics, computerized process control, and information technology. One student with previous work experience described the value of mechatronics in terms of helping to “connect the dots” between different systems and processes of production. “[It] sheds a little bit of light on how everything works and how to troubleshoot things.” The growing demand in the multi-skilled technician/mechatronics pathway reflects the broader shift toward automation in production processes and lean manufacturing methods, where there is less specialization of the workforce and more emphasis on ensuring that the system as a whole functions smoothly.

Although the multi-skilled technician/mechatronics pathway has elements of other long-established fields, it brings in a strong emphasis on robotics, as robot arms increasingly replace humans in performing the most repetitive tasks on assembly lines. In this context, the workers have to be trained in a wider variety of skill areas so that they can jump in to resolve different types of problems as they arise and monitor the information systems that track key performance indicators.

For the M-CAM multi-skill technician/mechatronics work group, adjusting training programs to meet the growing demand for skilled workers in this pathway has involved the creation of several new noncredit and for-credit training programs, large-scale expansion of labs and purchases of new equipment, and the alignment of new courses with industry-recognized credentials.

Overall, the multi-skill technician/mechatronics pathway has been an area of tremendous growth in training curricula in a very short period of time, in large part due to M-CAM. The TAACCCT grant enabled the consortium colleges to engage in much-needed debate and discussion about what a balanced curriculum that met employer needs would look like. Although each college customized its programs to meet the specific needs in its area and adapt to the resources available, M-CAM helped standardize curricula and ensure that decisions about certifications and equipment were well informed by perspectives from around the state.

Faculty Perspectives
Multi-skilled technician/mechatronics faculty members are generally excited about the growth in the field and grateful for the opportunity provided by M-CAM to invest in the development of new programs and purchase new equipment. Although some faculty members found it frustrating to get new programs approved at their colleges because of the length of time it took, they
appreciated the M-CAM work group because it provided an opportunity to learn from other colleges. They also found it relatively easy to convince deans and other decision makers about the importance of multi-skill technicians/mechatronics—even if it took some time to obtain approvals in some cases.

There was a lot of exchange and discussion in the multi-skill technician/mechatronics work group about how to build a balanced curriculum that meets a variety of employer needs. Several of the colleges went to great lengths to gather employer feedback on what the new multi-skill technician/mechatronics programs should cover and which certifications add value. Faculty members then took this feedback to the work group meetings, where they valued the opportunity to learn from other colleges, because it became clear that employers in each area expressed different training needs.

Although faculty members generally valued the M-CAM consortium work groups for multi-skill technician/mechatronics, there was a lot of controversy and vigorous debate about which third-party industry certification to align the curriculum with. Some faculty members had a strong preference for PMMI certifications, some preferred Siemens, and some wanted to incorporate both because they saw them as complementary. Most of the colleges chose certifications in accordance with what local employers identified as their key priorities. Siemens is a teaching and learning methodology, and thus uses an integrated approach to approaching content, whereas PMMI is focused more on the development of specific skills.

Some faculty members questioned the value of adding certifications altogether, while others saw it as beneficial for students but not necessarily for employers. In part, the controversy among faculty members over which certifications to choose and their value overall is reflective of the fact that the industry itself has not yet settled on a specific set of certifications or adopted industry-wide standards. This is not unusual in an emerging field, and it suggests that M-CAM provides a valuable venue for lead faculty members from several of Michigan’s community colleges to begin forging a consensus that takes multiple perspectives and economic regions into account. In the long run, this is likely to strengthen the Michigan community college system as a whole, along with its ability to contribute to a regionally coordinated approach to economic development. Future work in this area could involve more balancing out of programs with a variety of content areas, to allow them to move away from overspecialization in electronics or other specific fields. It is also likely to include more integration of robotics instruction.

Noncredit Training Programs
Grand Rapids and Lansing created new noncredit multi-skill technician/mechatronics programs (Exhibit 21). The new noncredit program at Grand Rapids is called the Maintenance Automation
Program (MAP), and it is run through the M-TEC department—a noncredit workforce development-focused department at the college. The multi-skill technician/mechatronics faculty members said that the process of developing the noncredit program helped strengthen the relationship between the academic (for-credit) side of the college and M-TEC.

Lansing’s new noncredit program runs for 10–12 months and includes Automotive Manufacturing Technical Education Collaborative (AMTEC) online training modules. Students who complete their training modules can test for PMMI Fluid Power 1, Mechanical Components I, and Siemens Level 1.

**Exhibit 20: New Noncredit Multi-Skill Technician/Mechatronics Programs**

<table>
<thead>
<tr>
<th>College</th>
<th>Program</th>
<th>Credential(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grand Rapids</td>
<td>Mechatronics/Controls Maintenance Automation Program (MAP)</td>
<td>Certificate of completion</td>
</tr>
<tr>
<td>Lansing</td>
<td>Mechatronics</td>
<td>Certificate PMMI Siemens AMTEC</td>
</tr>
</tbody>
</table>

Macomb was the only college that had an existing noncredit multi-skill technician/mechatronics program that it enhanced as part of M-CAM (Exhibit 22). Macomb had already built a fairly large multi-skill technician/mechatronics curriculum prior to M-CAM—the largest in the consortium. As such, Macomb’s program became a model for the other colleges. At the start of M-CAM, however, this noncredit program was largely disconnected from the for-credit programs, so in addition to adding some equipment and online components to existing courses, one of the major achievements was creating an articulation agreement. With this agreement in place, Multi-Skilled Technician certificate completers who have earned the Siemens or PMMI certification can now earn credits if they transfer into one of Macomb’s credit-based programs.

**Exhibit 21: Enhanced Noncredit Multi-Skill Technician/Mechatronics Programs**

<table>
<thead>
<tr>
<th>College</th>
<th>Program</th>
<th>Credential(s)</th>
<th>Enhancements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macomb</td>
<td>Controls Robotics Technician</td>
<td>Certificate of completion PMMI PLC 1 OSHA 10</td>
<td>Added Tooling U Added equipment</td>
</tr>
<tr>
<td>Macomb</td>
<td>Quality Control Technician</td>
<td>Certificate of completion</td>
<td>Added Tooling U Added equipment</td>
</tr>
<tr>
<td>Macomb</td>
<td>UG – Catia NX 0.0</td>
<td>Certificate of completion</td>
<td>Added Teamcenter software New vendor</td>
</tr>
</tbody>
</table>
For-Credit Training Programs

Bay, Lake Michigan, and Schoolcraft all created multiple new credit-based programs in mechatronics as part of M-CAM (Exhibit 23). Given that the process of creating new curricula is often slow and very resource-intensive, having this many new mechatronics programs represents a substantial increase in the capacity of Michigan community colleges to offer multi-skill technician/mechatronics training. Each college allocated faculty resources differently to create the new programs. At Bay, a faculty member was moved from another department to create the new certificate and associate degree programs, while at Lake Michigan an existing electronics faculty member designed the program. Schoolcraft hired a new part-time instructor who had experience at Ford production plants to create its new program. One faculty member described approaching the Dean to get approval for the new program as an easy argument:

"I just had to put it down on paper and present it to the dean and say, “You know what, I think this makes sense. If we’re looking to create new programs to meet the needs of our industry, locally and nationally, because you have to understand, automation is taking hold across the country, not just here.”"

- Faculty Member, Lake Michigan

The instructor then had the program approved through a curriculum committee and the college’s board. Faculty members at other institutions described the process in a similar way, although in some colleges it took longer than in others.

### Exhibit 22: New For-Credit Multi-Skill Technician/Mechatronics Programs

<table>
<thead>
<tr>
<th>College</th>
<th>Program</th>
<th>Credits</th>
<th>Credential(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bay</td>
<td>Mechatronics</td>
<td>24</td>
<td>Certificate of completion PMMI</td>
</tr>
<tr>
<td>Bay</td>
<td>Mechatronics &amp; Robotics Systems</td>
<td>52</td>
<td>Associate of Applied Sciences PMMI</td>
</tr>
<tr>
<td>Lake Michigan</td>
<td>Mechatronics Technology</td>
<td>17</td>
<td>Certificate of completion PMMI</td>
</tr>
<tr>
<td>Lake Michigan</td>
<td>Mechatronics Technology</td>
<td>63</td>
<td>Associate of Applied Sciences PMMI</td>
</tr>
<tr>
<td>Schoolcraft</td>
<td>Mechatronics Skills</td>
<td>18</td>
<td>Certificate of completion</td>
</tr>
<tr>
<td>Schoolcraft</td>
<td>Mechatronics</td>
<td>39</td>
<td>Certificate of completion PMMI</td>
</tr>
</tbody>
</table>

PMMI
Both Bay and Lake Michigan opted to focus only on aligning their new curricula with PMMI, because Siemens was not highly utilized among the employer base in either region. Schoolcraft chose to align to both PMMI and Siemens, because employers in its area recognize and utilize both.

The other five colleges in the consortium used M-CAM funds to enhance their existing credit-based programs, typically by aligning them with industry certifications, adding new equipment, upgrading the curriculum, and adding online course components (Exhibit 24). Lansing is changing the curriculum to a modularized format, based on the example that Kellogg had in place. Mott upgraded its mechatronics offerings to be more balanced across multiple areas, because previously it was heavily focused on electronics. Macomb also used M-CAM funds to enhance two MAT² for-credit programs in multi-skill technician/mechatronics that are based on a German pedagogical model (they were originally funded through another grant in cooperation with other community colleges).

### Exhibit 23: Enhanced For-Credit Multi-Skill Technician/Mechatronics Programs

<table>
<thead>
<tr>
<th>College</th>
<th>Program</th>
<th>Credential(s)</th>
<th>Enhancements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grand Rapids</td>
<td>Electrical Controls/Mechatronics</td>
<td>Certificate of completion PMMI</td>
<td>Added PMMI Added equipment</td>
</tr>
<tr>
<td>Kellogg</td>
<td>Industrial Electricity and Electronics</td>
<td>Certificate PMMI</td>
<td>Added equipment Upgraded curriculum Added Tooling U, Edufactor</td>
</tr>
<tr>
<td>Kellogg</td>
<td>Industrial Electricity and Electronics</td>
<td>Associate of Applied Sciences PMMI</td>
<td>Added equipment Updated curriculum Added Tooling U, Edufactor</td>
</tr>
<tr>
<td>Kellogg</td>
<td>Industrial Technology</td>
<td>Certificate PMMI MSSC</td>
<td>Added equipment Updated curriculum Added Tooling U, Edufactor</td>
</tr>
<tr>
<td>Kellogg</td>
<td>Industrial Technology</td>
<td>Associate of Applied Sciences PMMI MSSC</td>
<td>Added equipment Updated curriculum Added Tooling U, Edufactor</td>
</tr>
<tr>
<td>Lansing</td>
<td>Mechatronics</td>
<td>Associate of Applied Sciences PMMI Siemens</td>
<td>Updated curriculum Modularized curriculum Added equipment Added AMTEC Added PMMI &amp; Siemens</td>
</tr>
<tr>
<td>Lansing</td>
<td>Mechatronics</td>
<td>Certificate of completion PMMI Siemens</td>
<td>Added equipment Added PMMI &amp; Siemens</td>
</tr>
<tr>
<td>College</td>
<td>Program</td>
<td>Credential(s)</td>
<td>Enhancements</td>
</tr>
<tr>
<td>---------</td>
<td>---------------------------------------------</td>
<td>--------------------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>Macomb</td>
<td>Automated Systems Technology</td>
<td>Associate of Applied Sciences</td>
<td>Added equipment</td>
</tr>
<tr>
<td>Macomb</td>
<td>MAT² Mechatronics</td>
<td>Associate in General Studies</td>
<td>Added equipment, noncredit courses</td>
</tr>
<tr>
<td>Macomb</td>
<td>MAT² Production Design</td>
<td>Associate in General Studies</td>
<td>Added equipment, noncredit courses</td>
</tr>
<tr>
<td>Mott</td>
<td>Electronics and Electrical Technology</td>
<td>Associate of Applied Sciences</td>
<td>Added PMMI &amp; Siemens, new courses, equipment</td>
</tr>
<tr>
<td>Mott</td>
<td>Electronics and Electrical Technology</td>
<td>Certificate of completion</td>
<td>Added PMMI &amp; Siemens, new courses, equipment</td>
</tr>
</tbody>
</table>

**Enhancements to Equipment, Facilities, and Hands-On Learning**

The significant enhancements to the multi-skill technician/mechatronics curricula at each of the M-CAM colleges would not have been possible without a significant infusion of new equipment. The most common pieces of equipment that M-CAM colleges purchased were Amatrol learning systems, FANUC robot cells, programmable logic controller (PLC) machines, hydraulic trainers, fluid power trainers, AMTEC trainers, and computer equipment. The Amatrol learning systems are flexible assembly systems that mimic a real production line and can be recombined in various ways to teach different skills. Faculty members felt that the additional equipment was critical to making curriculum development possible.
Examples of Multi-Skill Technician/Mechatronics Equipment Purchased by M-CAM Colleges

Several M-CAM colleges purchased FANUC robot cells to train students in mechatronics and multi-skill technician courses. Equipment, coursework, and faculty certifications also enabled them to certify students in FANUC. FANUC robots can be used in machining, robotics, mechatronics, welding, and other advanced manufacturing fields.

M-CAM colleges purchased flexible integrated assembly systems, which mimic production lines, for mechatronics and multi-skilled technician courses. The automated cell stations can be adapted for different production process configurations.

Hands-on learning is a major emphasis of the new curricula, because students need to practice on the machines to really understand how to use them. One student remarked on how the hands-on learning is used to reinforce what the teacher lectures on in the classroom:

> Our class has a great balance of being in the class and being hands-on. When we cover it in the class, it seems to move a little quick. You're trying to absorb it all. But once we go out and practice it hands-on it all comes together. In that aspect, I think it's a great way to learn. It's also very practical because we need to know how to operate the robots and get a realistic view of what the control panels and components look like and how to troubleshoot. You can only do that by being hands-on.

– Student, Macomb

Student Perspectives

Student feedback in the Multi-Skilled Technician/Mechatronics pathway was overwhelmingly positive, especially when they reflected on the quality of instruction and experience of their instructors.

[Our instructor has] got a lot of experience. He knows where we're coming from. You can tell that he was out on the floor working just like we were at one point....He
can put stuff into perspective…. And say, this is how it should have worked or this is how it is. He breaks it right down our level to where we know what’s going on so.

– Student, Grand Rapids

[My instructor] was amazing, the best teacher. I actually still stayed in contact with him afterwards… He really made [the content] relatable… He teaches the content in a way that is fun. He really knows what he is talking about as well, so, and that comes across and he did a great job with making it easy to understand.

– Student, Macomb

Although most students were satisfied, some complained about the fast pace of Multi-Skilled Technician/Mechatronics training programs. Some students found the amount of material covered to be overwhelming, and claimed that the ability of their instructors to help them keep up was mixed. In some of the newer programs, some students also said that having more courses to choose from would be beneficial, even if they were existing courses such as welding or basic mechanics. Given that these programs are still in the piloting stage, it seems reasonable to assume that the offerings are likely to increase or adjust to student demand over time. Overall, students appeared to be very interested in their courses and inspired by the new technology that was available. One student who had graduated and was working in the field said that due to the hands-on experience he’d received, he felt more knowledgeable than the average new person coming into that position, even people coming from bachelors’ programs.

Conclusion

Overall, M-CAM has had a substantial impact on curricula in the three core pathways: Welding, Machining, and Multi-Skill / Mechatronics. The Multi-Skill / Mechatronics field expanded the most because it is a relatively new pathway, and it emerged a direct response to broader shifts in industry to automate production processes. However, a number of programs in Welding and Machining were also enhanced in significant ways, particularly through the adoption of new technologies and alignment with industry-recognized credentials.

Despite the debate that arose in many colleges about the value of professional credentials, they are an integral part of creating a stackable career pathways system that allows individuals multiple entry and exit points. Therefore, M-CAM provided a forum for instructors to debate which professional credentials to use, learn the pros and cons of different credentials, and engage with employers to get their feedback on them. Instructors in colleges that were trying to make major enhancements to one of their pathways saw the work groups as a valuable resource for comparing and standardizing curricula, as well as learning about new course formats – such as the modularized programs at Kellogg that are for-credit and self-paced.

There were also some challenges that colleges faced in enhancing their curricula in the core areas, specifically:
College leadership has to be engaged with system-wide thinking in order to promote noncredit to credit bridges. A systems perspective appears to make a difference in the ability of faculty and staff to implement innovative noncredit to credit bridges and provide more “on-ramps” into core programs. Institutional legacies of separation between noncredit and for-credit programs remain a barrier to a pathways approach at several colleges.

Faculty retirement and turnover affected the pace of implementation. Although in some cases faculty retirement helped invigorate changes to curricula in a core pathway, the colleges had a high number of retirements during the course of the grant and at times it took a while for new faculty to get up-to-speed.

Despite these challenges, the M-CAM grant had a significant impact on standardizing, expanding, and updating training curricula in Welding, Machining, and Multi-Skill / Mechatronics. The new equipment not only allowed students to learn on the latest machines, it also changed the image of the colleges and the field of manufacturing in the local community as a whole. The M-CAM work groups also helped build stronger networks between instructors in the same field across different parts of the state, which may have lasting effects if some of the relationships are maintained. Specifically, the work groups helped equalize and standardize the training curricula in each pathway and provided a forum to exchange information and perspectives. Many of the instructors felt that this opportunity was the most valuable aspect of the grant.
Chapter 7: Facilitating Career Pathway Access and Progress

Career pathways systems are most effective when they have multiple entry points. M-CAM aimed to promote individuals’ access to career pathways in manufacturing by strengthening students’ academic and “soft” skills and providing entry-level training and orientation to manufacturing. In addition, the initiative was designed to help students progress along manufacturing career pathways by allowing them to earn credit for what they already know and providing mechanisms for them to transfer credit from one institution to another so that they can continue their training. These objectives were strengthened by several features of the M-CAM design, including prior learning assessments, foundational skills training, the production pathway, online courses, and articulation policies. The consortium is still in the process of implementing each of these features. Taken together, these innovative design elements are part of institutional shifts leading towards more flexible, easier-to-negotiate career-pathways.

Prior Learning Assessment

Prior Learning Assessment (PLA) is an emerging strategy for building on-ramps into training for older students and adults already in the workplace. PLA processes allow students to earn college credit for college-level knowledge and skills that they learned in a noncredit setting or outside of a formal educational setting, such as previous employment or military experience. Evidence suggests that PLA processes help adults complete degrees more quickly, and that they improve subsequent re-enrollment rates. 11 Although strengthening prior learning assessment policies is a goal shared by the consortium colleges, they have made limited progress on this issue to date.

All of the M-CAM colleges have PLA policies in place that pre-dated the grant. They use different terminology—“credit for prior learning,” “credit by experience,” “credit for previously acquired knowledge and learning experience,” and “credit for prior education”—for these PLA-related policies. Some colleges have policies for awarding credit based on industry certifications, and others have processes that focus on awarding credits for noncredit coursework. At most colleges, the process requires that the student be aware of the option to obtain credit for prior learning and that he or she request or initiate the approval process (as opposed to an automatic process).

Our site visits to each college indicated that students are not very aware of the option to obtain PLA credit or of how to apply it to their own certificate or degree program. This was especially the case for noncredit students in job training or workforce development programs. Further, all the M-CAM colleges charge a fee for PLA assessment on a per-course, per-exam basis, which adds an additional barrier for students with limited financial means. Finally, most institutions will not accept PLA credit awarded at another institution as a form of transfer credit. This means that

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students who are awarded PLA credits upon entering an M-CAM college program may face barriers in transferring these credits to continue their education at another college.

In sum, although PLA is an important feature of improved career pathway access, the grant has not yet led to shifts in how the process operates at each of the colleges, and it has not yet helped students to enter and move more quickly along manufacturing pathways.

**Foundational Skills Training**

The lack of strong work readiness and basic skills is commonly cited by manufacturing employers as a problem for individuals seeking entry-level positions. In part based on direct feedback from employers, the M-CAM consortium colleges identified a need to enhance their offerings in foundational skills. Foundational skills training includes basic skills remediation (usually in math and reading) but also instruction in work readiness skills (often referred to as soft skills), financial literacy, and job search skills. The consortium’s (evidence-based) assumption was that with stronger skills in these areas students would not only be more likely to finish their current programs, but also more prepared to advance along their education pathway and enter employment successfully. All of the colleges have been able to implement some form of foundational skills training into their M-CAM programs, but the approaches and content areas vary significantly and there have been challenges along the way that have slowed implementation.

**M-CAM Approaches to Enhancing Foundational Skills**

The M-CAM consortium colleges have used five different approaches to enhance foundational skills training:

1. **Harnessing and supplementing existing resources** – Referring participants to other providers of foundational skills training on campus and supplementing those offerings, as needed, with targeted workshops or cohort programs relevant to advanced manufacturing pathways.

2. **Contextualized learning**[^12] – Embedding foundational skills training into existing technical training courses through real-world applications.

3. **Online basic skills testing and remediation** – Offering students access to online skills training software packages, including Edmentum, and other skills enhancement software, alongside their regular coursework.

4. **Boot camp-style pre-enrollment cohort programs** – Requiring noncredit students to complete an intensive preparation course—typically lasting 40–80 hours and covering a wide range of foundational skills—prior to enrolling in technical training.

[^12]: In a contextualized learning environment, “students discover meaningful relationships between abstract ideas and practical applications in the context of the real world; concepts are internalized through the process of discovering, reinforcing, and relating.” [http://www.cord.org/contextual-learning-definition/](http://www.cord.org/contextual-learning-definition/)
5. **Supplemental workshops** – Holding voluntary workshops on specific topics, such as resume writing or financial management skills, to supplement the existing foundational skills resources on campus.

All M-CAM colleges had systems in place for remediating basic skills in math and reading prior to the TAACCCT grant, especially in for-credit programs, because students typically have to meet certain skill standards just to get into those programs. Therefore, colleges have required assessment during the enrollment process to identify whether or not a student is eligible to enroll; if a student does not meet the standard then he or she is referred to remedial courses on campus.

For noncredit courses, students usually do not have to attain a specific skill level before enrolling, but the colleges have on-campus resources for students who need extra help or tutoring. For example, the Federal TRIO program provides supportive services and tutoring in basic skills to students with disabilities (including learning disabilities). Many instructors, especially in noncredit programs, already teach in a way that incorporates foundational skills instruction out of necessity, given that the individuals they teach tend to have more skill deficiencies than those in for-credit classes. For example, instructors and staff members noted that because math deficiencies can slow students down, departments offer math remediation options to students, both in credit-based and noncredit programs. Some colleges (including Grand Rapids, Kellogg, and Macomb) also had the ACT National Career Readiness Certificate (NCRC)\(^\text{13}\) programs in place before M-CAM.

Given this assortment of existing resources, the consortium colleges did not want to duplicate efforts, so they leveraged and strengthened connections to these resources and added two or more of the other four approaches to enhancing foundational skills, as shown in Exhibit 25. Overall, all eight colleges were successful in offering content on communication skills, basic computer skills, reading skills, and math skills. Seven out of eight colleges offered study skills instruction.

**Exhibit 24: Approaches Used to Provide Foundational Skills Training**

<table>
<thead>
<tr>
<th></th>
<th>Harnessing Existing Resources</th>
<th>Contextualized Learning</th>
<th>Boot Camps</th>
<th>Workshops</th>
<th>Online Skill Remediation Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bay</td>
<td>![Icon]</td>
<td>![Icon]</td>
<td>![Icon]</td>
<td>![Icon]</td>
<td>![Icon]</td>
</tr>
<tr>
<td>Grand Rapids</td>
<td>![Icon]</td>
<td>![Icon]</td>
<td>![Icon]</td>
<td>![Icon]</td>
<td>![Icon]</td>
</tr>
<tr>
<td>Kellogg</td>
<td>![Icon]</td>
<td>![Icon]</td>
<td>![Icon]</td>
<td>![Icon]</td>
<td>![Icon]</td>
</tr>
<tr>
<td>Lake Michigan</td>
<td>![Icon]</td>
<td>![Icon]</td>
<td>![Icon]</td>
<td>![Icon]</td>
<td>![Icon]</td>
</tr>
</tbody>
</table>

\(^\text{13}\) NCRC is an assessment tool that evaluates core knowledge in communication, math, reading, basic computer skills, study skills and financial literacy.
Harnessing Existing Resources | Contextualized Learning | Boot Camps | Workshops | Online Skill Remediation Tools
---|---|---|---|---
Lansing | | | | |
Macomb | | | | |
Mott | | | | |
Schoolcraft | | | | |

### Key Findings on Foundational Skills Training Enhancements
The M-CAM colleges used TAACCCT funds to enhance foundational skills in the following ways:

- **The colleges strengthened institutional linkages to existing resources on campus.** Several colleges have made a concerted effort to develop stronger relationships and referrals between the advanced manufacturing programs and existing skills remediation resources on campus. For example, the M-CAM program manager at Bay College strengthened ties with the Federal TRIO program on campus, which provides tutoring to many Welding students who are in danger of dropping out. This resulted in a significant reduction in dropout rates and will likely result in lasting institutional changes even after M-CAM because administrators are so impressed with these results.

- **M-CAM Career Coaches referred students to foundational skills training.** M-CAM career coaches worked closely with students during the M-CAM enrollment process to identify barriers to success, including financial literacy barriers. Most of the colleges felt that they were meeting the intent of the financial literacy component of foundational skills by personally assisting students to address financial barriers.

- **The colleges offered more remediation in technical math, the most common area of basic skills deficiency in advanced manufacturing.** In response to the math skills gap, M-CAM program managers at several colleges enhanced the technical math training that occurred alongside coursework in each pathway. For example, Schoolcraft launched a Technical Math course (Math 102) to help students enrolled in occupational programs master math concepts. Mott added 4 hours per week of technical math instruction to an existing welding class.

- **Several colleges used grant funds to purchase and deploy online skill remediation tools.** The colleges used M-CAM funds to purchase Edmentum licenses. Edmentum’s Plato
Courseware provides online content including personalized instruction and assessments to help students prepare for college and career success. Bay, Grand Rapids, Kellogg, Landing, and Schoolcraft are utilizing Edmentum to assist M-CAM students with developing foundational skills. According to one foundational skills instructor, “Edmentum has been a good tool for us because it helps address where [students] are deficient;” he added, “Edmentum is focused on contextualized [learning].” Although all eight colleges received funding to purchase software licenses for online training, not all have incorporated online remediation tools into their foundational skills programs.

**The colleges added specialized workshops.** These add-on courses included voluntary workshops for for-credit programs at Bay and a required class for noncredit programs at Macomb. These helped to round out the resources available to students participating in M-CAM; however, because they are not a permanent part of the curriculum, they may not last beyond the M-CAM funding horizon.

**Macomb brought employers in to the classroom to speak about soft skills.** Although previous foundational skills trainers got push-back from students who just wanted to dive into the technical content, Macomb staff members have had more success at communicating the value of foundational skills by having employers talk about soft skills during the orientation. This suggests that work-based learning opportunities and situating soft skills training in real workplace settings may offer promising pedagogical methods for non-traditional students and students with multiple barriers.

**Foundational skills were integrated into the curriculum in Kellogg’s production program.** Although foundational skills were already part of Kellogg’s production program before M-CAM, it appears to be a best practice among the colleges because it emphasizes teaching soft skills, which students often do not embrace readily. Students commented that the training helped them to understand the world of work and feel better prepared to encounter certain workplace situations. A case study student said the Kellogg’s program changed his perspective on math, because after taking contextualized math, he realized it was something he could be successful in.

**Challenges**

Although the colleges already had many resources in place to deliver foundational skills training and instructors often informally incorporated applied foundational skills training into their courses, the notion of integrating formal foundational skills training—especially soft skills training—into the existing curriculum was a new concept for many faculty members and students. This factor, along with others, resulted in a number of challenges:

**Some faculty members are resistant to incorporating foundational skills into the existing curriculum.** Faculty members at some colleges felt that their classrooms were better suited for technical training rather than for teaching math skills or soft skills, so they resisted any changes to their existing curriculum.
Attendance for optional workshops was low. Program managers said that it was often difficult to get students to attend optional workshops because there were no clear incentives for them to go to an extra training on top of their normal coursework. Many colleges that housed foundational skills in a noncredit department had trouble getting credit students to take advantage of workshops or other supportive services that they organized.

Most students do not see the value of foundational skills training or feel they need it. Generally, students were very critical of their foundational skills training components, saying that math teachers confused them and that the soft skills sessions were not useful. As a result, implementing the soft skills and financial literacy components of foundational skills training has been particularly slow at many M-CAM colleges. The colleges that did the most effective soft skills training already had those structures in place before M-CAM.

Colleges had difficulty integrating key components of foundational skills instruction into existing credit programs. For credit-based programs, it was difficult for the M-CAM program staff to incorporate foundational skills content because it needed to go through a formal approval process. For example, at Grand Rapids, the project manager stated, “[M-CAM colleges] need to think about how institutions will contextualize it because it requires curriculum changes. [It is] hard to change existing programs because complete rewrite involves a lot of work. Staffing issues, aid issues, curriculum review, etc. made it a huge undertaking.”

The colleges have not widely incorporated financial literacy skills into foundational skills training. Only four colleges provided robust training opportunities in this area. Kellogg’s program was the most robust, in that all students in its entry-level credit-bearing production program receive six hours of financial literacy training.

Students often need more guidance than online tools can offer. Several faculty members observed that online tools are an inadequate substitute for the in-person assistance that students with deficient math skills require. For example, a career coach at Kellogg helped a production student improve his math skills by sitting with him after class to review course content one-on-one. The career coach stated, “The basic skills portion [of the foundational skills training] cannot be done completely online or in a [group session]
because many students struggle with general concepts and need someone to help them navigate through these areas so they do not feel alone or isolated.”

Although employers are demanding technical skills, especially in the advanced manufacturing sector, they also want employees who have the “soft skills” needed to succeed on the job. Even though most M-CAM program staff members and instructors agreed that foundational skills (many of which fit into the “soft skills” category) are important for student development and employability, there was little agreement on where or how these skills should be taught. In addition, students had very mixed perceptions about the foundational skills training they received, with some students suggesting they would have failed their program without the assistance and others, particularly older re-entry students, saying that requiring them to attend such training was a waste of their time.

Production Operations Training

The production operations pathway in M-CAM differs substantially from the three other pathways (Welding, CNC machining, and Multi-Skill / Mechatronics) because it fills a gap in the curriculum in the first rungs of a career pathways ladder. It begins at the entry level and prepares students to move to semi-skilled levels of technical expertise in manufacturing. Generally speaking, production operations programs focus on providing a general overview of what manufacturing work involves, such as the established practices for managing safety, quality, and efficiency in different types of production processes (e.g., Fordist assembly lines and lean manufacturing). The M-CAM colleges that have entry-level training programs in production operations generally see them as “feeder programs” leading into the core pathways and exposing students to different training options in advanced manufacturing. Because these programs have been very popular with employers, they have served as effective ways for students to get quickly into the workplace.

Four colleges currently offer production programs as part of M-CAM: Grand Rapids, Kellogg, Mott, and Lansing. Except for Kellogg’s production program, which is a unique setup, all of the production programs are noncredit job training programs. The consortium colleges working on developing the production programs chose to align their production programs with the Manufacturing Skills Standards Council (MSSC) Certified Production Technician (CPT) certification. The CPT certification has five modules: safety, maintenance awareness, production processes, quality practices and management, and green production. As part of the noncredit course repertoire, the M-CAM colleges have delivered production training programs as part of workforce development job training departments or centers, customized trainings, and incumbent worker trainings.

New Production Programs

Grand Rapids, Lansing, and Mott introduced new noncredit production programs with M-CAM funding (Exhibit 26). Employer interest motivated the college to build capacity in this area. Grand Rapids created new programs leading to an Industrial Sewing Certificate, a CPT Certificate, and a Manufacturing Readiness Certification and added ancillary certifications to the training (OSHA
30 safety, forklift, and first aid). Lansing and Mott both introduced new MSSC Certificate programs, and Mott added OSHA 30 safety as an ancillary certification.

**Exhibit 25: New Noncredit Production Operations Programs**

<table>
<thead>
<tr>
<th>College</th>
<th>Program</th>
<th>Credential(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grand Rapids</td>
<td>Industrial Sewing Certification</td>
<td>Certificate of completion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MSSC - Quality</td>
</tr>
<tr>
<td>Grand Rapids</td>
<td>Manufacturing Readiness Certification</td>
<td>Certificate of completion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MSSC – CPT, OSHA 30, Forklift, First Aid/CPR</td>
</tr>
<tr>
<td>Grand Rapids</td>
<td>Certified Production Technician</td>
<td>Certificate of completion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MSSC – CPT</td>
</tr>
<tr>
<td>Lansing</td>
<td>Certified Production Technician</td>
<td>Certificate of completion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MSSC – CPT</td>
</tr>
<tr>
<td>Mott</td>
<td>Production Operations</td>
<td>MSSC – CPT, OSHA 30</td>
</tr>
</tbody>
</table>

Mott’s production program is still in the piloting stage and the program does not yet have full-time faculty. However, Mott’s workforce development center (the noncredit division of the college that leads M-CAM) has received such an overwhelming response from employers that it started offering the MSSC-CPT course as an incumbent worker training.

**Enhanced Production Programs**

Grand Rapids and Lansing also enhanced their existing noncredit production programs. In response to employer demand, Grand Rapids added the MSSC-CPT quality certification to its Advanced Manufacturing Certificate program. Lansing updated the curricula of its Problem Solving for Production and Team Building for Production certificate programs by adding new activities, and it added a leaders’ guide to the curriculum of the Problem Solving program.

Kellogg enhanced its Kellogg Advanced Manufacturing Assembly (KAMA) program using M-CAM funds. KAMA is a manufacturing assembly training program that incorporates foundational skills and occupational skills training and runs from 8:00 a.m. to 4:30 p.m. Monday to Friday for four weeks. KAMA was originally created in 2013 through Goodwill’s Essential Skills Demanded by Great Employers (EDGE) program as a partnership between the community college, Goodwill, Michigan Works!, and an economic development organization called Battle Creek Unlimited. It was funded by the W.K. Kellogg Foundation and is intended to target low-income residents in Battle Creek.

The KAMA program is for-credit and includes 32 hours of hands-on instruction in the form of a production simulation. It is offered three to five times per year and has cohorts of 15–20 students. Students receive eight credits that articulate to other Industrial Trade and workforce degree programs at Kellogg. The content includes 33 hours of soft skills instruction (covering professionalism, interviewing, stress management, financial literacy, time management, etc.), computer applications, workplace math, workplace writing, and then technical training related to
production. The technical training covers workplace competencies (Introduction to manufacturing, 5-S, value stream mapping, problem solving, and team building), industry-wide entry-level competencies (OSHA 10 safety, Lock Out Tag Out, lifting and tool safety, and lean manufacturing), and industry-wide production simulation, which includes hands-on time in the Regional Manufacturing Technology Center labs.

M-CAM funds were used to expand the foundational skills components of the KAMA program by adding Edmentum as an online tool for skill remediation. The majority of M-CAM participants at Kellogg are enrolled in the KAMA program.

**Enhancements to Equipment, Facilities, and Hands-On Learning**

None of the M-CAM colleges purchased any new equipment for the production pathway. Most of the equipment that is used for production training is the same equipment that is used in the core pathways.

Hands-on training is a very important aspect of production training, especially if it is intended to serve as an on-ramp that opens doors for non-traditional students. All of the new and altered production programs have a strong hands-on component, where students contextualize and apply foundational skills to a production setting using cutting-edge technology.

**Hands-on Learning in Production Operations**

Students participate in Kellogg’s KAMA production operations training program. This program prepares students for high-demand production jobs. The KAMA program includes a series of hands-on learning experiences using 88 component parts and 29 separate quality specifications. Students work on an actual manufacturing line to assemble an experimental model car and learn to apply a variety of skill sets and production concepts, including how to read charts, measure takt time, analyze unit time, and conduct quality inspections.
**Student Perspectives**

Based on feedback from students that we spoke with in focus groups and case studies, the production programs at M-CAM colleges appear to be providing an important bridge for students into training by broadening their horizons. “It made me want to go to college,” said one student. “[It] helped me get my foot in the door for college.” The program “kept me motivated,” said another student.

Several students also appreciated the quality of instruction, especially the hands-on and interactive style of teaching. Below, two students describe what they valued about their instructors:

> The best parts of the program were how the instructor interacted with everybody and worked with everybody. It made the content easier to get through. They would take people that were struggling and work with them. If they had questions every instructor was great about answering them and explaining. That is what made it easy.

> – Student, Kellogg

> I valued all the instructors; they encouraged everybody to step up and be a leader. Not to just sit back and let me get my work done and not care about someone else. They encouraged us to be team-oriented and help somebody and say, “What are you struggling with?”

> – Student, Kellogg

Although there are limited data on exactly how students transition from production programs to more advanced stages of a specific advanced manufacturing pathway, student feedback indicates that the training does have a positive effect on students’ perceptions of education and its value for their future career options. Even though graduates of production programs are likely to earn less than their counterparts in the core pathways, they are still in the early stages of career advancement and may return to climb higher up one of the career pathway ladders.

**Online Courses**

Offering online courses—including hybrid classes that have online sections—is another strategy that has been shown to be effective in making training programs more flexible and accessible to non-traditional students. Because students can fit online courses into their schedules more easily and access them from anywhere with an internet connection, promoting this form of training is often a key component of DOL’s TAACCCT grants. Many colleges and universities across the country are currently shifting some of their curricula online, part of a larger trend towards greater use of distance education.

Typically, courses at an introductory level are the first priority to convert to an online format because they have the highest demand and require the least one-on-one attention from faculty. However, advanced manufacturing training is, by nature, more hands-on than education in other
disciplines, so the M-CAM consortium has found it challenging to implement online courses and progress has been slow. That said, several faculty members noted that some introductory-level content, even in very applied fields of industry, is conducive to presentation in an online format. This content includes such topics as technical terms, standards, and safety procedures.

Thus far, M-CAM’s consortium-wide activities in developing online courses have largely focused on integrating Tooling U into existing curricula to create hybrid course options.\footnote{http://www.toolingu.com/} Tooling U is an online manufacturing training curriculum that offers several packages of courses, including entry-level technical foundation skills courses that are directly related to manufacturing. Although M-CAM funded licenses for Tooling U for all the colleges, only some have actively adopted it. The most common reasons that colleges gave for not adding Tooling U include a lack of sufficient computer lab space near the manufacturing training area and resistance from faculty members rooted in a feeling that their students require a lot more one-on-one instruction to be successful.

Other colleges have undertaken independent efforts in the area of online instruction. Mott does not use Tooling U, but it purchased an off-the-shelf MSSC-aligned course that is used to teach production courses. It is available in a hybrid form with classroom instruction and online components. Lansing has used AMTEC and MSSC content to develop hybrid courses.

Bay College embarked on a separate effort to create a new online gaming-inspired course in the Multi-Skill / Mechatronics pathway, LearnPLC, which is open source and entirely online.\footnote{https://plc.csl.mtu.edu/} Bay used M-CAM funds to contract with Michigan Technological University (Michigan Tech) to create this interactive gaming-style course on programmable logic controllers (PLCs). See Exhibits 27 and 28.

\footnote{http://www.toolingu.com/}
\footnote{https://plc.csl.mtu.edu/}
Learn PLC has 12 modules: Binary and Decimal, Logic Gates, Hardware, PLC Simulator, Timers, Counters, Sequencers and Shift Registers, Program Control, Math Instructions, PLC Installation & Troubleshooting, SCADA, and Water Treatment. Users create a free account online, and then they can proceed in a self-guided manner through each module.

Although the online course is still in the final stages of completion, Bay has already incorporated this curriculum into its new Multi-Skill / Mechatronics certificate program and existing water technology program. The software is licensed as free software under a General Public License (GPL), which allows end users to run, study, share, copy, and modify it. Bay also has an online circuit fundamentals course that is online, but it was not developed using M-CAM funds.
Challenges with Developing Online Courses

M-CAM colleges have faced two main challenges in meeting their targets for the development of online and hybrid courses. First, many faculty members feel that online instruction is not compatible with their teaching. They believe that the students they work with require one-on-one assistance and encouragement to stay motivated in advanced manufacturing coursework, especially older students who often struggle with basic computer skills. Some also hold the view that manufacturing, by its nature, requires a learning-by-doing approach to familiarize students with the machinery and the production process in a real-world setting. Second, faculty and staff members reported that they have not had sufficient time to work on multiple pieces of the TAACCCT grant at once, so they have focused their efforts on curriculum upgrades, articulation, equipment acquisition, and aligning programs to employer demand. As Kellogg’s project director said, “The same groups working on the Online Learning Communities and MOOCs are overburdened with curriculum alignment pieces.”

Articulation

Articulation enables a student to receive credit for coursework completed at one college (or high school) when transferring to another institution or, in the case of noncredit-to-credit articulation, when transferring from one division to another in the same college. Because they increase the
portability of learning, articulation mechanisms enhance the ability of students to progress in their education and gain the knowledge, skills, and credentials needed for higher quality employment. Establishing new articulation agreements is a complex process in career pathways development, because it requires coordination between people in multiple roles at different institutions to draft and approve the agreements.

**M-CAM’s vision for articulation**

The consortium’s vision for enhancing articulation was to make it easier for individuals to move in and out of training, and shift between different training sites, as required by the exigencies of their lives. Realizing this vision was an ambitious process, organized around four sequential steps:

- **Lay the groundwork for articulation.** Establish a consortium-wide process for coordinating articulation across pathways and colleges. Help staff members, faculty members, and registrars understand their roles and the timeframe for completing activities.

- **Create noncredit-to-credit bridges.** Enable noncredit students who are interested in transferring to a for-credit program in the same college to obtain credits for noncredit coursework. This is beneficial for students who start out in noncredit entry-level training but decide to pursue further training.

- **Establish articulation agreements among M-CAM colleges.** Allow students who wish to take classes at another M-CAM consortium college to transfer credits between colleges. This helps students who wish to transfer to another M-CAM college because it offers more advanced courses. It’s also beneficial for students who relocate for work or other reasons.

- **Establish articulation agreements with four-year institutions.** Facilitate transfers from an Associate’s Degree program at one of the M-CAM colleges to a four-year degree program in a related field at a Bachelors’ Degree-granting institution in Michigan. This is beneficial for students who seek to pursue the education they need for high-wage, higher-skill, and supervisory positions in advanced manufacturing.
In order to complete these steps, it was necessary for the consortium to coordinate with faculty and staff members in multiple positions across four pathways at eight colleges and two four-year universities. The complexity of this task has required a great deal of collaborative effort, and the process is still ongoing.

Lake Michigan was the lead for this component of the grant. Its M-CAM faculty and staff members worked with Macomb and the technical assistance provider Corporation for a Skilled Workforce to develop a detailed roadmap and timeline for working through the tasks needed to forge new agreements on each front. To date, two consortium-wide in-person meetings have been held—in September 2015 and February 2016—to bring together faculty members, program staff members, and college registrars. Another meeting is planned (at the time of this writing) for September 2016.

The consortium made a key decision early on to focus on awarding credit based on attainment of industry-recognized credentials rather than on a course-by-course equivalency basis. Kenneth Flowers, Interim Dean of Career and Workforce Education at Lake Michigan and the manager of the articulation process, said that this decision was the turning point in the
articulation-enhancement process and since then the process has moved more smoothly. Because faculty members in each of the pathway work groups had focused much attention on aligning curricula with industry-recognized credentials, credentials were good proxies for attainment of course-based knowledge and skills. Further, this decision did not close the door to course-based articulation: students who do not pass an industry certification assessment will still be eligible to go through their college’s PLA process to earn credit if they pass a course.

Exhibit 29 summarizes the current status of the consortium’s efforts to enhance articulation. At the upcoming September meeting in 2016, the colleges will celebrate the signing of a cross-college Memorandum of Understanding (MOU) for transferring credits between M-CAM colleges. The consortium is marketing this as a historic event for community colleges in the state of Michigan.

**Exhibit 26: Status of Articulation in Three Key Areas**

1) **Laying the groundwork for articulation**
   - Faculty members participated in pathway work groups to select common industry-recognized credentials and to align these with coursework.
   - The consortium established a consortium-wide timeline and set of activities through which to coordinate the process across colleges, and it shared resources related to articulation using the M-CAM Dropbox site.

2) **Creating noncredit-to-credit bridges**
   - Faculty members and registrars aligned industry certifications to coursework internally within each pathway.
   - College registrars established equivalency value for each certification.
   - Colleges developed internal Prior Learning Assessment (PLA) or transfer policy protocols to articulate to credit.

3) **Implementing articulation with other M-CAM colleges**
   - Colleges shared completed cross-walks and equivalency tables with other consortium colleges to identify gaps and similarities.
   - Colleges exchanged PLA and transfer policy protocols to familiarize themselves with policies at each college.
   - Colleges worked together to update and finalize the cross-college Memorandum of Understanding (MOU) for transferring credit between M-CAM consortium colleges, to be formally signed in September 2016.

4) **Implementing articulation with 4-year universities**
   - The M-CAM consortium has engaged Eastern Michigan University and Ferris State University to work on establishing articulation agreements for transferring credits from M-CAM college Associate’s Degree programs to Bachelor’s Degree programs at these universities.
The proposed process for articulating credits among M-CAM colleges begins when a student who has attained an industry-recognized certification seeks credit within his or her existing college or at another M-CAM college. The student will approach the registrar for the department he or she wishes to transfer to and apply to convert the certification to credit (Exhibit 30). If the student did not get a certification, he or she can also go through the college’s PLA process to receive credit. Once the registrar approves the student’s application, it becomes fixed credit.

**Exhibit 27: Proposed M-CAM Articulation Flowchart**

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**Challenges with Enhancing Articulation**

Due to the complexity of implementing a robust articulation process across several colleges and pathways, the consortium encountered a number of challenges. These are summarized below.

- **Coordinating across multiple institutions and actors in a relatively short time frame is difficult.** Because the M-CAM TAACCCT grant involves multiple pathways and departments on each campus and articulation also brings in four-year universities, the task of bringing all of these actors together within the time frame of the grant is monumental. The consortium engaged the support of CSW to help keep this process on schedule, but progress has still been slow and the effort will be ongoing for some time even after the end of the grant.

- **The goal of standardization is controversial.** Some faculty members were resistant to focusing too much on standardization across colleges because they felt that the different employer bases and labor markets in each region require customization.
Finding a way to manage these debates took some time and required flexibility and compromise on the part of all partners.

**Conclusion**

This chapter has covered a wide variety of strategies that are part of the M-CAM consortium’s attempts to facilitate access to advanced manufacturing pathways and remove institutional barriers to students’ career pathway progress. Because most of these strategies require a high level of intra- and inter-institutional coordination to achieve, implementation has been gradual and beset with a variety of challenges.

Nevertheless, the M-CAM colleges have made impressive progress and, most importantly, M-CAM has provided the impetus to set in motion institutional-level changes by convening appropriate people to discuss options for articulating credit. Mott’s Executive Dean of Workforce and Community Development, Robert Matthews, found this aspect to be the main contribution of the M-CAM TAACCCT grant:

> The interactions between and work that has developed between colleges... I think it’s huge. I think some of the things that we’ve done to try to move the state at-large in terms of this whole concept of wage record information—it’s still happening by ones and twos, but we’re making a little progress in that regard. We’ve moved a step farther in terms of trying to create a more formal process around articulation, within our own institution and amongst colleges.

– Faculty, Mott

When he said this, an M-CAM staff member agreed and then added:

> This [initiative] allows for us as colleges who face some of the same things... to be able to sit at the same table, have this dialogue, and be able to take these things back to our colleges and say, “This is how we can make these things work. This is how we can improve not just enrollment and revenue, but outcomes for our college; to train people for employment opportunities.”

– Faculty, Mott

Therefore, it is clear that the grant staff members and college leaders understand the big-picture career-pathways thinking that informed M-CAM, and they have bought into the idea of taking it to the next level in their colleges and in Michigan more broadly. Although milestones have been slow to manifest, there has been a significant effort to move the process of adopting a career-pathways model forward, step-by-step.
Chapter 8: Counseling and Student Support

Prior to receiving M-CAM TAACCCT funding, the consortium colleges had identified a significant gap in the career coaching and support services available to students interested in enrolling in credit and noncredit advanced manufacturing programs. To address this concern, all eight colleges agreed to institute, as part of the M-CAM initiative, an intrusive case management and career coaching model under which students would receive a wide variety of counseling and support services, including academic advising, help with educational planning, career coaching, job search and job placement assistance, and referrals for supportive services.

This enhanced student counseling and support is considered essential to the M-CAM initiative’s success because many community college students face significant barriers that can, if unaddressed, cause them to drop out. These barriers include, but are not limited to, being unprepared for college-level coursework, having competing work and family obligations, lacking experience in navigating complicated bureaucratic college enrollment and financial aid systems, lacking reliable transportation, and lacking the financial resources to cover their education costs. Although a number of research studies have shown that additional counseling—especially when that counseling is required and provided throughout a program of study—is an effective way to improve student performance and increase completion rates, few community colleges have the resources to provide such assistance.

TAACCCT grant funding provided the M-CAM colleges the opportunity to offer enhanced counseling and support to M-CAM students by providing the funds to hire additional staff members and develop closer referral linkages with workforce development agencies, community-based organizations, faith-based organizations, and other partners that could provide supportive and counseling services.

This chapter describes the methods used to deliver career counseling and student support, the staffing of this function, and the types of services provided to M-CAM students. It also discusses some of the early challenges encountered by the M-CAM colleges as they implemented the intrusive case management and career coaching model.

16 Of the cohort of students that entered a certificate or AAS program in 2010, only 19.5 percent completed their programs within 150 percent of the expected normal time. National Center for Education Statistics, Digest of Education Statistics, http://nces.ed.gov/programs/digest/d14/tables/dt14_326.20.asp.


18 Community College Research Center, “What We Know About Nonacademic Student Supports,” Teachers College, Columbia University (September 2013).

M-CAM’s Intrusive Case Management and Career Coaching Model

Working collaboratively, all eight M-CAM colleges identified key services that would be incorporated into the consortium’s intrusive case management and career coaching model. One of the main tenets of the model is that the delivery of student counseling and support should be a seminal event whereby the emphasis is placed on the individual needs of a given student in order to help the student achieve academic success and improve his or her employability skills and job placement prospects.

Exhibit 31 below provides a detailed diagram outlining the counseling and supports provided to M-CAM students under the TAACCCT grant’s career coaching model. This diagram illustrates that college staff members and career coaches work closely with students to provide assistance with intake and enrollment, assessment, educational and career planning, financial aid, supportive service needs, pre-training and training activities, job search and job placement assistance, and follow-up for up to three months after training completion.

Under this model, counseling and support are not distinct from other college functions like enrollment and training. In practice, then, a variety of college personnel with different job titles participate in providing the counseling and support that students need to succeed.

Students need to feel a connection with their college and staff and so the college needs to make students feel welcome and not like they are burdening anyone.

– Faculty Member, Kellogg
**Team-Based Approach to Student Support**

Under the team-based approach to student support envisioned by the M-CAM colleges, grant-funded college staff members collaborate with permanent college personnel (such as counselors and college career center staff members) and entities external to each college (including employers, economic development agencies, Michigan Works service center staff members, and faith- and community-based organizations) to provide the full spectrum of counseling and student support students need to successfully complete their training and obtain employment.
Although students seeking counseling and support at most colleges might interact with any number of external agencies and non-grant-funded college staff members, it is the grant-funded staff members who make up the core of the counseling system at each college, providing academic assistance and job search/placement assistance services to M-CAM students and helping to coordinate individual students’ access to other services.

As discussed in Chapter 2, all of the M-CAM colleges hired, under the grant, a minimum of one staff member whose job description included student support and coaching. Although these individuals have a variety of different job titles, the term “career coach” is used throughout this Chapter to describe these staff persons.

Five M-CAM colleges—mainly the larger colleges in terms of student population and M-CAM funding—hired additional staff members with grant funds, namely intake and recruitment specialists and job developers, who worked with employers on identifying available job openings and work-based learning opportunities and provided counseling, job search, and job placement assistance to students. For example, at Kellogg, the TAACCCT grant funded two-and-a-half career coaches who coordinated intake, career coaching, and job search and placement assistance, and at Grand Rapids, the grant funded four staff positions, two concentrated on intake, enrollment, and career coaching and two concentrated on job search and placement assistance. At the smallest college, Bay, the project manager was tasked with performing multiple duties, including advising and assisting students.

Exhibit 31 shows the broad variation in grant-funded staffing configurations across the eight colleges. The information in the exhibit is based on information collected during the round-two and round-three site visits.

### Exhibit 29: Grant-funded Counseling and Student Support Staff Members

<table>
<thead>
<tr>
<th>College</th>
<th>Total Number of Grant-funded Staff Members</th>
<th>Positions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bay</td>
<td>1</td>
<td>1 90% FTE project manager responsible for intake, career coaching, and job development</td>
</tr>
<tr>
<td>Grand Rapids</td>
<td>4</td>
<td>2 fulltime career advisors</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 fulltime job developers</td>
</tr>
<tr>
<td>Kellogg</td>
<td>2.5</td>
<td>2 fulltime career coaches</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 half-time career coach</td>
</tr>
<tr>
<td>Lake Michigan</td>
<td>1</td>
<td>1 fulltime intake worker, career counselor, and job developer</td>
</tr>
<tr>
<td>Lansing</td>
<td>3</td>
<td>1 fulltime success coach</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 fulltime career coach</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 part-time job developer</td>
</tr>
<tr>
<td>Macomb</td>
<td>5</td>
<td>1 fulltime intake coordinator, career coach job developer, and trainer.</td>
</tr>
<tr>
<td>College</td>
<td>Total Number of Grant-funded Staff Members</td>
<td>Positions</td>
</tr>
<tr>
<td>------------</td>
<td>-------------------------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 part-time recruitment coordinator</td>
</tr>
<tr>
<td>Mott</td>
<td>3</td>
<td>2 fulltime client service representatives</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 fulltime job developer</td>
</tr>
<tr>
<td>Schoolcraft</td>
<td>2</td>
<td>1 fulltime career counselor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 fulltime job developer/Employment Coordinator</td>
</tr>
</tbody>
</table>

Regardless of the number of grant-funded staff members, each M-CAM college reported working closely with its on- and off-campus partners—mainly college admissions, advising and job placement offices, Michigan Works!, Public Welfare Department, employer associations, and community- and faith-based organizations—to provide student assistance. According to one workforce partner affiliated with Mott, “Our job developers worked with their [job developers] and [the students] all finished and got placed….Our approach is that we are a partnership and a team. We don’t care if Mott gets the credit or we get the credit. What’s important is that we’ve helped the community.”

While M-CAM career coaches are the main providers of student support, instructors at the M-CAM consortium colleges also advise students about academic planning and scheduling, provide them with instructional assistance and career advice, and, in some cases, help connect them to jobs, internships, and apprenticeships. Instructors’ advice is valuable—many have industry experience—and required office hours give students the opportunity to seek it out. “Everybody here does it at some level,” said one faculty member from Lake Michigan, referring to instructors providing students with support and counseling. “We’re working on those things with our students all the time.”

**Interaction Between Student and Career Coach**

The approach to providing students with support through career coaches is generally similar across the credit and noncredit programs, as well as across the consortium colleges.

**The Initial Meeting**

Generally, career counselors will try to meet with a student at least once, in person, to help the student make informed career choices, complete the enrollment process for the college and the TAACCCT-funded grant, complete and review the results of assessments, and develop an individual employment development plan before the student officially starts the training program.

This initial meeting is important for several reasons. First, the career counselor can make sure that the student understands the requirements of both the TAACCCT grant and the training program in which they want to enroll. Second, the counselor can assess the student’s academic readiness and determine whether the career the student seeks seems like a good fit. If a student is basic skills-deficient, especially in reading and/or mathematics, the career coach can counsel the student about academic remediation or tutoring services; the counselor might also try to guide the student...
in a different direction in terms of career selection and training option based on the academic skills needed to complete the program. In one instance, a career coach helped a student decide to enroll in a noncredit Multi-Skill / Mechatronics program based on his assessment results. The career coach stated that the noncredit program was better suited to the student because it was self-paced and had multiple online tutorials built into the training modules. According to the student, “[the career coaches] are doing a really good job as far as making sure you have the tools that you need” to succeed.

Third, at some colleges, career coaches use these initial meetings to help students develop class schedules that are convenient and minimize student commuting time and costs, and to ensure that students do not enroll in classes that will not count toward program completion. Student focus group participants commented on how helpful this assistance was to them. For example, one focus group participant stated that his M-CAM career coach helped him to maximize credits earned from another college program so that he could complete a certificate program in a shorter period of time while still maintaining his employment.

Finally, these meetings help career coaches establish personal relationships with students. According to M-CAM career coaches, having an established relationship makes students more likely to seek help from coaches after enrollment and to provide follow-up information once they have exited TAACCCT-funded services. Student focus group feedback suggests that many students do not feel they need assistance from the career coaches and do not actively pursue services even if they are available to all students. Thus, M-CAM’s model of being intentional and deliberate about providing student supports was beneficial because it helped students to understand the value of such services.

**Subsequent Interaction**

Career coaches use a variety of methods, both formal and informal, to interact with noncredit and credit M-CAM students after the initial meeting. Once the initial face-to-face meeting has occurred, a career coach may communicate with a student by calling them on the telephone (the most common method), sending an email, meeting in-person, and sending text messages. Staff members at Schoolcraft reported using an email newsletter to share program information with students and to encourage them to utilize the career counselor services. Another unique method of contacting students was using a list serv of students enrolled in M-CAM training programs to send group texts about available job openings.
While the frequency of interaction with students varied significantly across colleges and between noncredit and for-credit programs, the majority of career coaches reported having monthly contact of some kind with most students. Some career coaches, especially those involved closely with noncredit programs, reported having daily to weekly contact with students.

Co-location of career coaches at M-CAM college training facilities has greatly facilitated interaction between career coaches and students. Traditionally, noncredit and for-credit students met advising and career coaching staff members at a main campus; co-location staff members at advanced manufacturing training centers has helped with service integration and fostered a closer working relationship between career coaches and students enrolled in M-CAM programs, as well as with affiliated faculty.

In general, students noted that career coaches made themselves quite available to students. Many career coaches reported that they responded to phone calls and emails every day, including late at night and on weekends. While it was difficult for M-CAM colleges with small career coaching staffs to have students engage with career coaches as frequently as desired, most M-CAM students we interviewed felt that career coaches worked hard to engage them and address their concerns and needs. Student focus group participants affirmed that career coaches were generally quite accessible, with one Bay student commenting that he and another student “stopped at [the career coach’s office] pretty much every Friday.” Having this kind of “open door” policy is one way members of the counseling staff try to make themselves available to students in the advanced manufacturing programs.

**Differences between Noncredit and Credit Students in the Receipt of Support from Career Coaches**

While the intention was to offer the same intensity of counseling and student support services to all students enrolled in the four M-CAM career pathways, noncredit students tend to have more frequent interaction with their career coaches than for-credit students at many of the M-CAM colleges.

**Exhibit 30: Frequency of Career Coach Interaction with M-CAM Students**

<table>
<thead>
<tr>
<th>College</th>
<th>Credit Students</th>
<th>Noncredit Students</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bay</strong></td>
<td>Monthly As needed</td>
<td>2–3 times per training module</td>
</tr>
<tr>
<td><strong>Grand Rapids</strong></td>
<td>As needed</td>
<td>3 times per week</td>
</tr>
<tr>
<td><strong>Kellogg</strong></td>
<td>Monthly (Regular Industrial Trades Program) Daily (KAMA Production Program)</td>
<td>Not applicable; operated credit programs only</td>
</tr>
<tr>
<td><strong>Lake Michigan</strong></td>
<td>As needed</td>
<td>Not applicable; operated credit programs only</td>
</tr>
<tr>
<td><strong>Lansing</strong></td>
<td>As needed</td>
<td>2–3 times per training module</td>
</tr>
<tr>
<td></td>
<td>Credit Students</td>
<td>Noncredit Students</td>
</tr>
<tr>
<td>----------------------</td>
<td>-----------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>Macomb</td>
<td>As needed</td>
<td>5-6 times per training program</td>
</tr>
<tr>
<td>Mott</td>
<td>As needed</td>
<td>Monthly</td>
</tr>
<tr>
<td>Schoolcraft</td>
<td>As needed</td>
<td>2 times per week</td>
</tr>
</tbody>
</table>

As shown in Exhibit 32 above, M-CAM career coaches work with credit students mainly on an as-needed basis whereas their interaction with noncredit students, though variable across the consortium colleges, usually occurs at regular intervals. M-CAM career coaches stated that the frequencies they reported are averages, and that some students require more frequent contact with career coaches to address academic and life situations. “The old rule of 10 percent of students take 90 percent of your time,” applies to M-CAM training programs, according to a Grand Rapids career coach.

The disparity in receipt of counseling and support between credit and noncredit students occurred for a number of reasons. One major reason was an indirect consequence of the open enrollment policy in place at all the colleges: noncredit students are required to meet with a M-CAM career coach in order to enroll—in part because many of the noncredit programs were developed specifically for M-CAM—whereas for-credit students, consistent with the open enrollment policy, can enroll in advanced manufacturing programs without meeting with a career coach.

Another major reason that noncredit students receive more counseling and support is that many of the M-CAM noncredit programs include built-in interaction between career coaches and students either at the beginning or the end of each training program. In many cases, this interaction is fostered through the foundational skills training, which is either embedded in the noncredit training programs or offered as a separate workshop near the end of the academic coursework.

At least three further reasons for noncredit students getting the lion’s share of counseling time emerged during the site visits. Many career coaches commented that noncredit students require more attention than credit students because the training programs affiliated with noncredit workforce development programs are short and fast-paced. In addition, they said, noncredit students tend to have lower basic skill levels than credit students and lack strong work histories, so they require more support and intervention to succeed in training and obtain employment. Finally, career coaches said that they assume that credit students can receive any needed advice or support from faculty members and staff members in other college departments.

Although various factors favor noncredit students in terms of obtaining counseling and support from grant-funded staff, career coaches are aware of this systemic bias and try to have at least monthly contact with credit students. Career coaches sometimes “track down” credit students to

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Thanks to all of the [career counselor’s] help though the TAACCT grant, I had all the support and help I needed and now I am ready to go forward with a great resume and career help to get the job I want!

— Student, Bay College
have them complete enrollment paperwork after they start attending classes. Some career coaches make frequent visits to classes to discuss M-CAM services and to encourage students to schedule counseling appointments. Career coaches also spend time roaming the hallways to talk with students and see if they need any assistance. Despite these pro-active strategies, however, many M-CAM career coaches report that they rely on credit students to seek them out when they need assistance.

**Types of Support Provided to Students by M-CAM Career Coaches**

During the first 10 quarters of grant implementation, M-CAM career coaches provided support to students in four primary areas: academic advising, career coaching, job search and placement assistance, and life issues. Each of these areas is discussed in greater detail in this section.

### Academic Advising

M-CAM career coaches provide students with several types of academic support. They help students select a career pathway and training program, choose courses and set up class schedules, navigate the college enrollment process (e.g., college paperwork, assessments, financial aid), improve study skills, and access college tutoring services. Each of these areas is described in further detail below.

- **Helping students identify an appropriate career pathway and select a training program.** Using the career pathway models and other labor market information, career coaches help students make informed decisions about their academic program of study. As part of the career pathway and training program selection process, M-CAM career coaches also gather detailed information from students to develop an individual Employment Development Plan (EDP). This EDP includes information about the student's
skills, abilities, assessment results (if available), educational history, employment history, vocational and skills remediation needs, finances, demographics, and career goals (short and long-term). Career coaches reported documenting EDP development in an electronic case file for students using the consortium’s ETO data collection system. The EDP was developed during the initial intake process and updated periodically.

- **Assisting with placement in academic and career readiness programs** (i.e. foundational skills programs). As described in Chapter 7, all eight M-CAM colleges either developed or referred students to foundational skills programs.

- **Assisting with course selection and class schedules.** M-CAM career coaches assist students with making course selections and setting up class schedules that are as convenient as possible. At M-CAM colleges that offer credit programs, career coaches work with students at the beginning of each semester to help them select classes and make course schedules. They do this to make sure that students do not waste time on classes that would not count toward completion of their programs of study and to accommodate students’ work schedules. This assistance has been particularly important for students who are dealing with barriers such as significant work or family obligations or transportation difficulties.

- **Assisting with enrolling in a college and in TAACCCT.** M-CAM career coaches help students navigate the college and TAACCCT enrollment processes; this includes helping students complete required college applications, schedule assessment exams, and complete financial aid documentation. A number of focus group participants from across the M-CAM colleges reported that assistance with the college enrollment process was very valuable to them and helped to make their transition to college easier.

- **Providing study skills assistance and access to tutoring.** Career coaches help students develop the study skills they need to succeed in their training programs. For example, noncredit students usually receive some information at the beginning of their programs about the importance of attending classes and the need to come to class prepared. Career coaches also commonly help credit students access tutoring offered elsewhere on campus. One M-CAM student at Lansing commented that the career coach was instrumental in helping him to obtain additional time to take his exams due to his diagnosis of post-traumatic stress disorder (PTSD). Without this assistance, the student stated that he would have likely dropped out of the training program.

- **Providing information about career ladders and assisting students in understanding articulation opportunities.** In limited cases, noncredit and credit students also receive valuable information about building a career ladder that can start out in noncredit programs and build to one year certificates to two- and four-year degrees.
Monitoring student attendance and achievement. Career coaches from five M-CAM colleges reported monitoring student attendance and achievement in order to identify students who are struggling in their training programs. A number of career coaches commented that monitoring student attendance and progress from the start of training helped them to assist students in obtaining remediation before they fell too far behind and overcome other challenges affecting their performance in class (e.g., childcare and transportation issues).

The most recent student survey data indicate that 87 percent of respondents across all four M-CAM career pathways are very or somewhat satisfied with the academic support services received through M-CAM. Satisfaction with academic support services varies only slightly across the four career pathways, with 89 percent of Multi-Skilled Technician/Mechatronics program respondents giving a rating of very or somewhat satisfied compared 84 percent for Machining. Overall, satisfaction with academic support services varies slightly across credit and noncredit programs, with 91 percent of credit program respondents giving a very or somewhat satisfied rating versus 86 percent of noncredit students giving the same rating.

The survey data also suggest that noncredit and credit students have different academic advising needs. Noncredit students are often older incumbent workers with work histories and are not necessarily looking for academic advising services. Some survey respondents and focus group participants suggested that they simply enrolled in the noncredit training to help them get a job quickly and were not happy when career coaches suggested that they needed academic remediation services. “I come from a manufacturing background with 14 years’ experience,” said an incumbent worker from Mott. “I took the program because I was told it would be helpful for entry-level supervisors, which I feel is the next move in my career.” He thought that the basic academic remediation components of the production training were not necessary for someone like himself.

Career Coaching

M-CAM-funded career coaches, success coaches, and/or job developers prepare students for the job search process by assisting them with developing or improving their resumes and developing cover letters to accompany their resumes, and by providing information on how to look for jobs and succeed in employment interviews. M-CAM career coaches are also instrumental in helping to identify work-based learning (WBL) opportunities for students enrolled in M-CAM programs.

Providing assistance with resume writing and cover letters. At all M-CAM colleges, career coaches work with students to create or revise their resumes and to develop customized cover letters. For most M-CAM students, this assistance is provided either individually or through group workshops. For example, in Lake Michigan’s M-CAM program, grant-funded staff members coordinated with the college’s Work-Based Learning Manager and Career Center Coordinator to conduct workshops for students on the fundamentals of developing a resume and then worked one-on-one, as needed, to refine and customize students’ resumes based on available job opportunities. At Grand Rapids, M-CAM students work one-on-one with one of two M-CAM-funded job developers
two weeks prior to completing their training programs to develop resumes and cover letters. In some instances, M-CAM career coaches referred students to Michigan Works! or their college career centers for resume and cover letter assistance.

**Providing information on conducting job searches.** Career coaches at all of the M-CAM colleges provide M-CAM students with training on, or information about, how to conduct successful job searches using the colleges’ online job portals, the State of Michigan’s Talent Bank, and proprietary websites like LinkedIn and Monster. At some M-CAM colleges, this training is embedded in the foundational skills curriculum, whereas at other M-CAM colleges career coaches conduct workshops for students or provide this assistance one-on-one. One employer partner commented that M-CAM students from Kellogg are prepared for their interviews and understand the products and services delivered by his company before even meeting with him, which sets them apart from other job applicants.

**Preparing students for employer interviews.** Career coaches often work closely with M-CAM students to help prepare them for employer interviews by holding mock interviews and hosting dress-for-success events. A few colleges coordinate with local advanced manufacturing employers and employment agencies to conduct mock interviews with students in order to prepare them in advance for employer interviews. Students at Kellogg reported that having the opportunity to practice and prepare ahead of time helped them to be successful in their actual job interviews and feel less stressed. “We did mock interviews,” said one student from Kellogg, “and then they would tell us what we did wrong and we would have actual interviews.”

**Developing work-based learning opportunities.** Career coaches from all eight M-CAM colleges work closely with faculty members and employers in their local communities to identify work-based learning opportunities (WBL) for students in M-CAM programs. M-CAM colleges are providing students with work-based learning experiences such as work-site tours, guest speakers, demonstrations, on-the-job training, internship and apprenticeship opportunities, and incumbent worker training programs. While the depth of these opportunities varies significantly across the M-CAM consortium, grant-funded counseling and job development staff members at most colleges work to create stronger relationships with employers, and this has led to more work-based learning opportunities being integrated into the advanced manufacturing programs at M-CAM colleges. M-CAM staff members reported that WBL opportunities provide students...
with a variety of benefits, including better knowledge of career options, increased self-confidence, real workplace experience, and improved employability skills. Career coaches from all eight M-CAM colleges stated that M-CAM brought increased awareness of the need to offer WBL opportunities to students and allowed them additional time to engage faculty and employers in providing these experiences. In the case of one college (Grand Rapids), M-CAM helped fund faculty members to go out and meet with industry leaders and attend industry events, which made them better advocates for WBL activities at their college. In another college (Schoolcraft), the college was able to create a credit internship program for students in the welding program, which has helped students acquire work readiness and skills and “real-world experience.”

Based on most recent student survey data, 84 percent of respondents across all four M-CAM career pathways are very or somewhat satisfied with the career information and career counseling services they received through M-CAM. Satisfaction with career information and career counseling varies slightly across the four career pathways, with 91 percent of Machining program respondents giving a rating of very or somewhat satisfied compared to 80 percent for Welding.

### Assisting Students with Job Searches and Providing Placement Assistance

Career coaches at all colleges provide M-CAM students with assistance in finding suitable jobs or work-based learning opportunities.

- **Providing job announcements and assisting students with their own independent job searches.** At all M-CAM colleges, career coaches conduct online job searches and create lists of available advanced manufacturing positions and share these with M-CAM students in binders, on bulletin boards, via email, and through online college search engines. Career coaches also coordinate with Michigan Works! and other community organizations to collect job leads to share with M-CAM students. Students are then encouraged to contact these employers and to apply for the positions independently.

- **Coordinating hiring events such as job fairs, speed networking events, and onsite interviewing sessions.** Career coaches at all eight M-CAM colleges coordinate with college career offices, Michigan Works!, and employer associations to put on job fairs, speed networking events, and onsite interviewing sessions for M-CAM students. Due to the demand for skilled labor in many of the colleges’ geographic regions, career coaches have been able to set up interviews or hiring events at their colleges for M-CAM students. In some cases, these events are M-CAM specific; in others the M-CAM career coaches coordinate with the college to host larger job fairs.
Matching students to appropriate job or work-based learning opportunities. Career coaches and/or job developers at all M-CAM colleges match M-CAM students with appropriate jobs, internships, or apprenticeship opportunities. Career coaches work closely with students to identify their employment needs (including minimum starting wage, preferred location, and desired work hours/shifts) and their transportation limitations before working to match students to job openings. In many instances, because the supply of skilled workers is so limited, employers contacted the colleges directly to place “job orders” and to obtain appropriate referrals from M-CAM career coaches.

- **Recommending students to specific employers.** Career coaches and/or job developers contact suitable employers that they have relationships with, or cold-call those that have appropriate open positions, to suggest that they consider for employment particular students from the M-CAM programs.

- **Coordinating with temporary employment service agencies for suitable employment.** Career coaches from five M-CAM colleges—Grand Rapids, Kellogg, Lansing, Macomb, and Schoolcraft—work closely with private placement agencies in their local communities to help M-CAM students obtain employment. Career coaches indicate that it is very common for advanced manufacturers to utilize staffing service agencies to coordinate their hiring, especially for entry-level positions.

Based on the most recent student survey data, 82 percent of respondents across all four M-CAM career pathways are very or somewhat satisfied with the job search and job placement services they received through M-CAM. Satisfaction with job search and job placement assistance varies slightly across the four career pathways, with 87 percent of Welding program respondents giving a rating of very or somewhat satisfied compared to 77 percent for Production. The lower satisfaction rating for the Production pathway is likely because many of the positions appropriate for completers of this pathway are entry-level and do not pay as well as those available to the completers of the other career pathways.

The comment section of the student survey revealed that a subset of students, approximately 17 percent of those that responded to the survey, have not found work and feel relatively strongly that M-CAM job placement services are not adequate. According to one student, “The training
was fine. [I] need more help finding a job. I don’t think they should wait until the last week to send out resumes to their contacts.” Negative comments like these suggest that some of the M-CAM colleges could do a better job of following-up with students after graduation to ensure that they have found a job.

**Dealing with Life Issues**

A final type of student support provided by M-CAM career coaches is assistance in dealing with “life issues,” such as challenges related to living arrangements, health, transportation, work issues, and family obligations.

- **Assisting students in dealing with life challenges.** M-CAM career coaches provide advice and counseling about how to deal with these difficulties, typically through one-on-one meetings. For example, one career coach at Kellogg helped a student obtain a birth certificate, which in turn helped him obtain his driver’s license and facilitated his being able to obtain transportation to and from college. M-CAM focus group participants commented that this kind of assistance was particularly helpful and made them feel like they were not alone in addressing life issues and challenges.

- **Referring students for appropriate supportive services such as financial aid, childcare, and transportation assistance.** Working in close collaboration with Michigan Works! service center staff members, Public Welfare Department, and community- and faith-based organizations, M-CAM career coaches provide M-CAM students with supportive service referrals. Career coaches find that many students need help obtaining scholarships or financial aid, accessing childcare, arranging transportation, and finding housing. Many M-CAM focus group participants, however, felt that more could be done to connect them to supportive services, especially financial assistance. This sentiment was shared by many M-CAM faculty and program staff members, one of whom from Macomb stated, “If there was a thing I wish we could do, it would be to add a little more umbrella to the people who are desperately you know financially burdened, [giving them] gas money, or lunch money, or transportation so that they can get there. [For] some of these people literally we take a collection, give them gas money, give them all the empty bottle [to recycle].”

  - Because TAACCCT funds could not be used to provide supportive services to M-CAM students, many colleges used other resources from their college foundations or from other organizations to assist students. Students received funds or vouchers to help pay for childcare, transportation, utilities, books, tuition, and school supplies from a wide variety of organizations, including Michigan Works! service centers, Public Welfare offices, housing departments, churches, and community-based organizations (e.g., Goodwill, Legal Services, etc.).
Career coaches from four M-CAM colleges reported that their colleges have foundations that help students cover the cost of tuition, supplies, housing, transportation, food, books, clothing, and supportive services. M-CAM career coaches were very proactive in helping students obtain assistance from their respective college foundations.

Based on the most recent student survey data, 89 percent of respondents across all four M-CAM career pathways are very or somewhat satisfied with the help they received with personal challenges and life issues.

**Challenges in Providing Students with Counseling and Support**

M-CAM colleges faced a number of challenges related to providing academic counseling, career coaching, job development and placement assistance, and help with life issues.

- Delays in hiring and turnover in the career coach positions resulted in disruptions in service delivery. At least four colleges experienced turnover in career coaching positions after the beginning of the grant, which resulted in diminished career counseling and job search and placement assistance to many M-CAM students.

- Challenging workloads prevented career coaches from more proactively reaching out to M-CAM students to ensure they had sufficient support. As discussed in Chapter 4, some M-CAM colleges implemented both for-credit and noncredit training programs across multiple career pathways. In some instances, as the training programs grew in size, some career coaches’ workloads became unmanageable, which prevented them from reaching out to students to ensure that they had as much support as they needed.

- Employment verification is time-consuming and difficult to manage. Career coaches and job developers from six M-CAM colleges reported that verifying student employment and wages is very time-consuming and challenging. Many staff members stated that they spend a tremendous amount of time contacting students who have completed their training to inquire about employment outcomes to no avail. According to one career coach, “the biggest challenge is with [the] follow-up requirement, because once students obtain employment it is harder to stay in touch with them.” Through SPR, M-CAM consortium has gained access to wage data, but these data are in aggregate, not individual-participant level.

- Due to enrollment processes for credit students, not all such students were connected to a career coach. Many credit students have opted not to enroll in the TAACCCT-funded M-CAM grant, which means a large number of credit students are not accessing available student supports. M-CAM career coaches and intake staff members conducted multiple information sessions and recruiting events to improve participation among credit students, which led to improved enrollment levels. However, there was still concern among many career coaches that they were not reaching the full cohort of students in their training programs.
Chapter 9: Participant Outcomes to Date

The M-CAM consortium strives to promote clear career pathways to well-paying advanced manufacturing jobs for participants. This chapter explores how far the consortium has come in realizing this goal as of July 31, 2016 by looking at various participant outcomes. To assess program completion rates and degree/certificate/certification completion rates, we drew on ETO data. To assess employment rates, wage increases, and retention in employment, we drew on both ETO and wage record data from the Michigan Workforce Development Agency. For both sets of analyses, we used student interview and survey data to contextualize outcomes and their patterns. Appendix C includes an overview of the consortium’s progress toward the DOL outcomes. The outcomes we present here are preliminary, as the M-CAM colleges had nine months to continue to serve students at the time this report was written.

Program Completion

Completing a program of study is the crucial first step to a living-wage job. As discussed in Chapter 3, half (51 percent) of all M-CAM participants have completed a program of study by earning a college degree or certificate. Ten percent of participants who enrolled in M-CAM withdrew from their program without completing it. Of participants who have completed a program, close to 80 percent have exited TAACCCT services and the other 20 percent are still enrolled. Only 28 participants (two percent of all completers) have earned a college certificate and are currently pursuing a college degree through an M-CAM program. Eleven participants completed programs in multiple career pathways.

We observed differences in completion rates across the colleges in the consortium. Participants from Macomb and Grand Rapids were the most likely to complete and exit an M-CAM program. Participants from Mott and Lansing were the most likely to stay enrolled in TAACCCT services after earning a college degree or certificate.

According to results from the M-CAM Exit Survey, life conflicts were the major factor influencing non-completers’ decision to leave the program (71 percent of respondents gave this as their reason). Other common reasons included financial difficulties, the cost of tuition, and transportation barriers (each given as reasons by 29 percent of respondents). Eighteen percent

One of the people in our class had to drop because he was homeless. He couldn’t find a place to live up here. He ended up going back to Chicago. He was staying at shelters, bouncing around from shelter to shelter….I felt bad for the guy. He was a really good guy, really smart, knew his stuff. He was picking everything up really quick. I was really sad to see him go and not be able to finish and get a career.

– Student, Macomb

19 Colleges determine the point at which a participant should be exited from TAACCCT Services.
20 Because only 12 percent of non-completers who were invited to participate in the survey responded, these results may not be representative of all non-completers. Only five percent of non-completers who were invited to participate responded to the question related to their decision to leave their program of study.
left their programs because they found employment. It is important to keep in mind that, among survey respondents, the vast majority of non-completers (84 percent) reported that they were satisfied with the training and instruction that they received.

**Certifications (Academic Degrees or Certificates and Professional Credentials)**

College and professional certifications can put participants on an affordable path to a living wage. M-CAM programs are providing a large number of certifications, including college degrees, college certificates, and professional credentials. M-CAM participants across the eight colleges have earned 1,727 college certificates, 1,482 professional credentials, and 83 degrees. By the time they exited TAACCCT services, the majority of participants (87 percent) left their college with at least one of these certifications. About three-quarters of participants received a college certificate, almost 25 percent received one or more professional credentials, and four percent received a degree. Seventeen percent of exited participants earned both an academic credential (degree or college certificate) and a professional credential, while a small number of participants (one percent) earned both a college certificate and a degree. While non-credit students were more likely than credit students to earn a college certificate, credit and non-credit students earned professional credentials at similar rates. As shown in Exhibit 33, the percentage of exited participants who received any credential ranged from 93 percent to 57 percent at each college.

Given that each college offers a distinct set of programs, as shown in Appendix D, it is not surprising that there were differences in the types of certifications received by participants across the colleges of the consortium.

Specific findings include:

- Participants from Lake Michigan and Schoolcraft were the most likely to receive college degrees before exiting TAACCCT services.
- Participants from Grand Rapids and Macomb were the most likely to receive a college certificate.
- Participants from Mott were the most likely to receive a professional credential.

Yeah, [the American Welding Society certifications] definitely means a lot to me. It also means a lot to employers because that shows that you went through the time to get the actual certification by either a company or whoever to get certified by the actual governing body of welding. They write all the code – the AWS writes all of the welding codes for all of the companies in the U.S. and standards. So if you’re certified through them, then that shows that you know what you’re doing.

- Student, Grand Rapids
Exhibit 31: Completion of Credentials

**Percent of Exiters Completing Credentials, Overall**

<table>
<thead>
<tr>
<th>Credentials Type</th>
<th>Completion Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any Credential</td>
<td>87%</td>
</tr>
<tr>
<td>College Certificate</td>
<td>77%</td>
</tr>
<tr>
<td>Professional Credential</td>
<td>23%</td>
</tr>
<tr>
<td>Degree</td>
<td>4%</td>
</tr>
</tbody>
</table>

**Percent of Exiters Completing Credentials, By College**

<table>
<thead>
<tr>
<th>College</th>
<th>Any Credential</th>
<th>College Certificate</th>
<th>Professional Credential</th>
<th>Degree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grand Rapids</td>
<td>93%</td>
<td>91%</td>
<td>1%</td>
<td>6%</td>
</tr>
<tr>
<td>Macomb</td>
<td>92%</td>
<td>88%</td>
<td>30%</td>
<td>2%</td>
</tr>
<tr>
<td>Kellogg</td>
<td>86%</td>
<td>64%</td>
<td>27%</td>
<td>1%</td>
</tr>
<tr>
<td>Lansing</td>
<td>82%</td>
<td>80%</td>
<td>35%</td>
<td>2%</td>
</tr>
<tr>
<td>Lake Michigan</td>
<td>82%</td>
<td>67%</td>
<td>0%</td>
<td>14%</td>
</tr>
<tr>
<td>Mott</td>
<td>79%</td>
<td>68%</td>
<td>65%</td>
<td>0%</td>
</tr>
<tr>
<td>Schoolcraft</td>
<td>65%</td>
<td>38%</td>
<td>38%</td>
<td>29%</td>
</tr>
<tr>
<td>Bay</td>
<td>57%</td>
<td>51%</td>
<td>35%</td>
<td>0%</td>
</tr>
</tbody>
</table>

**Number of Participants Earning Professional Credentials and Number of Credentials Earned**

<table>
<thead>
<tr>
<th>Credential Description</th>
<th>Participants Earned</th>
<th>Total Credentials Earned</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Welding Society (AWS)</td>
<td>164</td>
<td>671</td>
</tr>
<tr>
<td>Forklift Certification</td>
<td>109</td>
<td>117</td>
</tr>
<tr>
<td>OSHA 30</td>
<td>107</td>
<td>114</td>
</tr>
<tr>
<td>National Institute for Metalworking Skills (NIMS)</td>
<td>93</td>
<td>289</td>
</tr>
<tr>
<td>Manufacturing Skills Standards Council (MSSC)</td>
<td>78</td>
<td>175</td>
</tr>
<tr>
<td>Other</td>
<td>18</td>
<td>39</td>
</tr>
<tr>
<td>Siemens</td>
<td>17</td>
<td>20</td>
</tr>
<tr>
<td>PMMI Mechatronics</td>
<td>16</td>
<td>44</td>
</tr>
<tr>
<td>ASQ</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>FANUC Certified Education CNC Training</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
Some groups of participants, as defined by demographic characteristics or career pathway, were more likely than others to receive certain certifications. For example, older participants and African American participants were less likely than others to receive a college degree, regardless of their career pathway. Likely due to the design of Multi-Skilled Technician/Mechatronics programs, very few participants in these programs received a professional credential (4 percent).

**Employment Outcomes**

Although program completion and attainment of certifications are significant outcomes for M-CAM colleges, the consortium’s primary objective is to connect participants with stable, well-paying employment. Three different employment-related outcomes provide relevant information about M-CAM’s progress in helping its participants attain this goal: employment rates, retention in employment through the third quarter after exit, and wage levels.

**Employment Placement**

Using employment placement data in ETO and wage records from the Workforce Development Agency, we calculated the employment rate of participants who successfully completed their M-CAM programs one quarter after exit (Exhibit 34). We list the key findings below:

- **Close to three-quarters of participants who successfully completed their programs were employed by the end of the first quarter after exit.** Two percent of participants were enrolled in further education and not employed, and about one-fourth were neither employed nor enrolled in further education.

- **About three out of four exited participants who completed our survey felt that their training helped them obtain their most recent job.** The number of participants expressing this belief varied.

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**I went from looking for a job to jobs looking for me now…. It changed my life, because I went from, like I say, from unemployed and the job I had before that one I was getting about $16.00 or $17.00 an hour and that was, I thought that was good. But, I went from that to $22.00 an hour plus per diems because I’m on a traveling team, so, it was, it’s definitely life altering.**

– Student, Macomb

---

21 Zero percent of African American participants received a college degree, compared to 4 percent of non-African-American participants. Two percent of participants older than 40 received a degree, compared to 4 percent of other participants.

22 To calculate employment and retention rates, we first used ETO data to determine if an individual was employed during the first quarter after exit, during the second quarter after exit, and/or during the third quarter after exit. When we did not have employment records for individuals for a given quarter, we used individual-level data from the Michigan Workforce Development Agency through the fourth quarter of 2015 to determine if that individual had any wage records during that quarter. To calculate wage levels, we used the placement data entered into ETO by college staff members.

23 Calculated from M-CAM Student Exit Survey results and only including participants who were employed at the time of the survey. Because of the low response rate, these findings may not be representative of all exited M-CAM participants.
somewhat across career pathways and credit type. Overall, participants in credit programs were more likely than those in noncredit programs to believe that their training helped them obtain their most recent job (82 percent versus 67 percent). Participants in CNC Machining programs were an exception to this pattern: credit and noncredit participants gave similar responses. Participants in Production were the least likely to credit their training with helping them obtain a job, with only 60 percent of respondents in agreement.

**Exhibit 32: Employment Outcomes of Completers One Quarter after Exit**

![Bar chart showing employment outcomes](chart)

- Earning a professional credential seemed to improve participants’ employment prospects more than earning a college certificate alone. Participants who earned a professional credential in addition to a college certificate or degree were more likely to be employed than those who only earned a college certificate or degree (79 percent versus 70 percent). With a post-exit employment rate of 48%, participants who earned a college degree were less likely to be employed, possibly because they were more likely to be enrolled in further education.24

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24 According to ETO records, participants with a college degree were not more likely than other participants to be enrolled in further education. However, it is unclear if participants are consistently reporting their enrollment in further education.
More than 80 percent of those employed after exit were employed in manufacturing-related industries. In comparison, only 66 percent of participants had been employed in manufacturing-related industries prior to enrolling in M-CAM programs, suggesting that participating in M-CAM increased the likelihood of a participant being employed in manufacturing. Exiters not employed in manufacturing were likely to be employed in food retail or administrative support jobs.

Employed participants who responded to our survey were satisfied with their new jobs. More than nine out of ten non-incumbent participants who were employed after exit were satisfied with their jobs. There was little difference in satisfaction rates across career pathways or credit vs. noncredit programs.

Exhibit 33: Employment by Industry

The CAD program was the quickest way for me to get out of these kinds of jobs that I hate and into something that I wanted to do, something that I would enjoy. And I do enjoy doing the CAD work because [of the design aspect]...and it’s a very best way to get accredited for a job. A job where you can support yourself and make a living.

—— Student, Schoolcraft

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25 This figure only includes 938 participants who had wage records for at least one quarter after exit. The number includes participants employed in manufacturing, scientific/technical services, or temporary employment agencies. We included temporary employment agencies because, during site visits, M-CAM staff and students said that manufacturers often do all of their hiring through temporary agencies and are frequent employers of M-CAM graduates.

26 Calculated from M-CAM Student Exit Survey results. Because of the low response rate, these findings may not be representative of all exited M-CAM participants.
The youngest and oldest participants struggled most to find employment. Employment rates followed a bell curve, with participants between the ages of 25 and 30 being the most likely to be employed. Participants under 25 were the most likely to be enrolled in further education. Survey responses of those who could not find work suggest that older students were not getting offered the types of positions that they were qualified for, while younger students lacked the work experience needed to get a job.

There is a dirty game being played by employers in the Detroit Metro area. They will only hire someone who is very hungry and desperate and will work for nothing. They will not hire experienced designers like myself who are older in years and who will not work for nothing. I have been looking for work for seven years and am still looking. (Student survey respondent).

I am just an inexperienced job seeker that has little chance of getting a job in this field. I think that if the funding for the program depended on the success of the students, the staff would have worked harder on placing the class in jobs. (Student survey respondent)

Not surprisingly, we found that employment placement rates among the colleges varied significantly according to size and economic condition of the local labor market. For example, 82 percent of participants who exited from Lansing were employed in the first quarter after exit. Lansing is located in a three-county metropolitan area that had an unemployment rate of 4.6 percent in May 2016. In contrast, only 40 percent of participants who exited from Bay—located in a large rural county with fewer jobs and an unemployment rate that ranged from 4.6 percent to 8.3 percent—were employed in the first quarter after exit.

**Employment Retention**

Landing a job after program exit is an important achievement, but employment does little good if it does not last. To assess employment retention, we calculated the percentage of those employed during the first quarter after exit who were still employed during the second and third quarter after exit using employment placement data in ETO and wage records from the Workforce Development Agency. Below we list the key findings emerging from this analysis:

- **Employment retention averaged about 75 percent, with some variation across colleges.** Of the 845 participants who successfully completed their programs and were employed during the quarter after exit, 73 percent remained employed through the following two quarters. Retention was highest among participants at Lansing (88 percent) and Grand Rapids (75 percent).

- **Younger participants had the lowest retention rates.** Close to three out of four participants aged 26 and

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27 Employment did not have to occur at the same employer. Participants had to show evidence of some employment in the first, second, and third quarter after exit through ETO or wage records.
older remained employed, compared to 69 percent of participants under 25. Older participants generally came to the program with more work experience and may have had clearer ideas about the jobs they wanted to pursue.

Exhibit 34: Employment Retention Through Third Quarter after Exit
(Includes 835 participants who were employed the quarter after exit and exited as of Oct. 1, 2015)

Of All Completers...

Of All Participants Employed Q1 After Exit...

Retention through Q3 by Age

Retention through Q3 by Pathway
Wages

The M-CAM consortium strives not only to connect participants with jobs, but to connect them with jobs that offer a family-sustaining wage. To assess the wages received by M-CAM participants after enrollment, we calculated two outcomes using placement data from ETO: 1) for all employed exiters, the highest wage received in job placements after enrollment, and (2) for participants employed at the time of enrollment, the wage at enrollment compared to the highest wage after exit.\(^{28}\) Findings revealed by this analysis are listed below:

- **Wages for job placements were generally well above the minimum wage.** The average wage participants received for new positions was $13.30, while the minimum wage in Michigan is $8.15. The average wages for M-CAM completers exceeds the living wage estimate of $10.10, which is the estimated hourly wage that an individual must earn to support themselves in Michigan.\(^{29}\)

- **About three-quarters (74%) of incumbent worker participants who successfully completed their programs earned a wage increase after enrollment.** On average, incumbent workers received a 10 percent wage increase as a result of M-CAM training. The percentage of incumbent workers who earned a wage increase was highest at Mott, Schoolcraft, and Kellogg.\(^{30}\)

- **Like employment placement and retention, average job placement wages varied across colleges and career pathways.** Participants from Schoolcraft and Macomb received the highest wages and participants from Mott and Bay received the lowest. This pattern, which is consistent across different career pathways, reflects variations in local labor markets. For example, in the Detroit Metropolitan Area, where both Macomb and Schoolcraft are located, machinists made an average of $23.42 per hour, compared to an average wage of $18.06 in the Upper Peninsula, where Bay is located.\(^{31}\) Overall, participants in Multi-Skilled Technician/Mechatronics programs received the highest wages, followed by CNC Machining.

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\(^{28}\) Because the wage records from the Workforce Development Agency do not include hourly wages, we relied exclusively on ETO data to analyze placement wages. At the time of this report, we had placement wage data for 43 percent of the participants that we know were employed at any point after enrollment.

\(^{29}\) The living wage calculator developed by MIT indicates that an individual adult can live on $10.10 an hour in Michigan. A sole breadwinner in a family of four, however, must earn $22.81 an hour to support a family. In a dual earner family of four, each parent would need to make (on average) $14.44 an hour. See: [http://livingwage.mit.edu/states/26](http://livingwage.mit.edu/states/26). Accessed 8/16/16.

\(^{30}\) Mott and Schoolcraft have only a handful of incumbent workers who have successfully completed their program (four and six participants respectively).

Participants over age 40 received higher wages than younger participants. Participants over 40 made an average of $14.42 per hour, compared to $12.66 among other participants. The youngest participants, those under 25, earned an average of $9.33 per hour. This age-based variation was especially noticeable among participants in Multi-Skill programs, where participants over 40 earned more than $4.00 per hour more than those under 25. Most older participants had work experience that would make them more valuable to prospective employers than younger applicants.

Among incumbent workers, the value of participating in M-CAM programs seemed to be highest for workers between the ages of 25 and 40. 85 percent of incumbent worker participants in this age group who completed their program received a wage increase.
compared to 76 percent of their counterparts under age 25 and 63 percent of their counterparts over age 35.

→ **African American participants earned lower wages on average than their white counterparts and were less likely to receive a wage increase if they were employed at enrollment.** This difference in wages (about $1.50 per hour on average) persisted across colleges and career pathways. Seventy-one percent of African American participants received a wage increase, compared to 76 percent of white participants.

### Shifts in Academic Self-Confidence

One of the core goals of M-CAM is to create an educational “step ladder” that will help students pursue further education, as needed, to advance their careers. For this strategy to be successful, M-CAM must address the psychological factors that result in students being motivated to engage in this pursuit. Our student interviews revealed that many of the students engaged in M-CAM programs have had negative experiences with schooling in the past. Older re-entering students were often returning to school after many years of work and needed to reorient themselves to what it was like to be in a college environment. Their basic math skills were often “rusty” and they felt intimidated by some of the content. Younger students had often struggled in high school, and came to the program feeling self-conscious and insecure about their academic abilities. One of the most prominent themes arising from student interviews is that the program helped to increase their self-confidence, their belief in their own ability to succeed academically, and their interest in pursuing additional education.

*I was a 1.5 GPA student in high school and now I have a 3.8-something GPA and it’s really helped me get my confidence back and made me realize what I did wrong in high school. It’s like a second chance and shows that I’m actually smart I guess, for lack of a better word.*

→ Student, Bay

*Before I got into the program, I was aimless. I had a job, but I did not have big goals. From being in the program, I now have goals for myself and they are pretty big, which is awesome. This class has made me think about where I want to be and pushed me towards that.*

→ Student, Lansing

*When I first came to this class, I just planned on finishing it, going to work. But now that I’ve come here, I’ve changed my mind. I want to get a degree in machining manufacturing. Something like that. And [my instructor] says teaching jobs are opening up for this. A lot of the teachers are getting old, quitting and retiring. So, I think that might be what I do. I might go back to school now.*

→ Student, Grand Rapids
I’m enjoying it. This is the first time back to school since high school. I love it. I was actually kind of scared to go back to school. Not so much anymore. This program has actually given me a lot of confidence.

– Student, Macomb

The final report will provide an update on participant-level outcomes related to program completion, certifications, employment, and wages.
Chapter 10: Conclusion

The participant-level outcomes of the M-CAM initiative, highlighted in Chapter 9, point to the positive influence that the TAACCCT grant has had on M-CAM student participants. The consortium has successfully engaged students in training and placed over 70 percent of these students into jobs. Many of these students would otherwise have been hard to place into employment, in that they are under 25 or over 40, are ex-offenders, or face significant life challenges such as homelessness. The students that completed M-CAM programs are well positioned to pursue further education in order to advance to higher-skilled jobs (paying higher wages) along manufacturing career pathways.

Although M-CAM colleges did not expect to serve a high number of incumbent workers with the M-CAM grant, their success at helping incumbent workers to expand their skills so that they can move into higher levels of employment is a notable accomplishment. The data showing that three quarters of incumbent workers who completed M-CAM training received a wage increase (with an average increase of 10 percent) is remarkable given a national context where wages have risen just 2.6 percentage points per year on average over the last ten years.32

These findings are impressive but they tell only part of the story. Helping M-CAM participants to advance their skills and find employment is central to the work of M-CAM and the mission of the colleges but it is not the final measure of whether the TAACCCT grant has succeeded. Much of the work of M-CAM has focused on improving institutional and systems-level structures, and the full benefits of this lengthy and ongoing process will not be felt until well after the last M-CAM participant is served.

In the meantime, many systems-level impacts are apparent or clearly taking shape. The colleges are using the M-CAM grant to strengthen their “collaborative capacity,” which is “the ability of organizations to enter into, develop, and sustain inter-organizational systems in pursuit of collective outcomes.”33 As highlighted below, the colleges are using the grant to connect with employers, workforce agencies, various other community partners, and one another. They are increasing alignment and coordination within their institutions and across institutions, and they are using data to hold each other accountable and raise standards.

In summary, the M-CAM colleges have...

⇒ Strengthened ties among Michigan community colleges. One of the primary accomplishments of M-CAM is a strengthening of coordination between colleges in a “non-system” state. The workgroup structure of the grant, with members from all colleges leading particular tasks, represents one of the novel aspects of M-CAM. The workgroup

approach, coupled with the monthly in-person strategy and operations meetings, has increased coordination between members, promoted collaboration and sharing of best practices among college leads and faculty, and promoted consistency in program development. In addition, the workgroup structure has helped to bring about accountability within the context of a decentralized decision-making structure.

- **Strengthened training programs through alignment with industry-recognized standards.** All of the colleges have incorporated industry-recognized standards and credentials into their advanced manufacturing programs. Through alignment with these standards, they have brought about a higher level of consistency in how advanced manufacturing programs are taught across the colleges.

- **Developed a plan for articulating credit within and across their institutions.** The decision to award credit for industry credentials provides a vehicle for noncredit students to earn credit for prior learning, thus giving them a leg up if they choose to pursue further education. It also allows each college to award credit for work completed in advanced manufacturing programs at the other colleges.

- **Increased coordination with local MI Works! service centers.** A number of M-CAM colleges—Bay, Grand Rapids, Kellogg, Lake Michigan, Lansing, Macomb, and Mott—worked closely with their workforce development counterparts in the local American Job Centers (called MI Works! service centers) to coordinate WBL opportunities, job search and job placement assistance, and supportive services for M-CAM students. Furthermore, the consortium as a whole met with Michigan Works! providers to discuss shared interests and how collaboration could be strengthened, particularly in the context of the Workforce Innovation and Opportunities Act (WIOA).

- **Improved coordination among faculty, advising staff, and college career services staff.** Six M-CAM colleges reported improvements in the coordination and linkages among faculty members of the advanced manufacturing programs, college advising staff members, and career services staff members. M-CAM career counselors at many colleges have worked closely with the college’s existing career services departments to provide job readiness training and services to M-CAM students and to re-invest in the college’s apprenticeship programs. For example, career center staff members at Kellogg provided customized resume writing and interviewing workshops for M-CAM students and participated in mock interviewing events. This collaboration freed up M-CAM career counselors to focus on other duties. College leads and other stakeholders are confident that these strengthened relationships will be sustained after the sunset of the grant.

- **Nearly doubled the number of employers they are working with.** As described in Chapter 5, the M-CAM colleges increased the number of employers they engaged, moving from 204 in Fall 2014 to 392 in Spring 2016. Employer partners participated in

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Our approach is that we are a partnership and a team. We don’t care if [the college] gets the credit or we get the credit. What’s important is that we’ve helped the community.

— Michigan Works!
planning and curriculum development, provided work-based learning opportunities, and coordinated with job placement staff members on placement into employment.

- **Develop a real-time, web-based longitudinal database to track student characteristics and outcomes for reporting and evaluation purposes.** The ETO database captures the key elements of M-CAM services, from intake to job placement, in a web-based system. Although the system has often been challenging to use and maintain, it has given the consortium the ability to look deeply at enrollment and emerging outcomes and to use that data to make real-time adjustments in how they approach the work. It has helped the colleges to identify and quickly rectify issues in data collection and data input, such as differences in how colleges were defining key outcomes. Overall, it has satisfied one of the core goals for the grant, while ensuring that colleges had the data needed to make sound decisions and identify areas for program improvement.

- **Laid the groundwork for increased data access.** Through the M-CAM evaluation, the colleges have been able to access long-term wage data on their participants from the state of Michigan. Currently, the colleges must go through SPR to access the data, but they used the grant as an opportunity to “move the needle” on data access and availability. Several college presidents met with the Director of Michigan’s Talent Investment Agency (TIA) to discuss the importance of data sharing and data access. They prepared a joint letter to TIA, signed by all college presidents, arguing that access to workforce data is vital for the colleges given that they face increased pressure to document the economic benefits of their programs for graduates.

### Looking Ahead

During the next year, SPR will continue to track and assess the maturation of the grant program, with an increased focus on systems-level outcomes and program impact. SPR evaluation staff members will continue with our core data-collection activities: (1) tracking outcomes data through the ETO database, (2) gathering wage data needed to understand labor market outcomes, and (3) administering our student satisfaction survey. In the fall of 2016, SPR’s team will conduct follow-up interviews with case study students to explore and understand their labor market experiences and interview systems leaders in Michigan to understand the influence that M-CAM has had at a state level. A fourth (and final) round of site visits, to be conducted in winter 2017, will focus on capturing student- and partner-level outcomes and on assessing the sustainability of grant reforms.

In addition to these activities, SPR has been gathering the data needed for our quasi-experimental study. We have been moving forward with a difference-in-difference design and have already gathered a first wave of data on the comparison groups from seven of the eight colleges. SPR will request a final extract of comparison group data from the colleges in May 2017.

SPR’s final report, to be completed in September 2017, will include summative findings from the implementation, outcomes, and quasi-experimental impact studies.
Appendix A: Evaluation Research Questions and Detailed Data Sources

Research Questions

What contextual factors influenced the implementation of the initiative?
- What factors facilitated implementation?
- What challenges did Coalition partners face? How did they address these challenges?

What administrative and partnership structures were established to guide the initiative?
- What was the program and administrative structure? What was each college’s role? What activities did Macomb Community College take on in order to coordinate and provide oversight for the M-CAM program?
- What roles did partners (workforce partners, employers, non-profit organizations, etc.) play in program design, curriculum development, recruitment, training, placement, program management, leveraging of resources, and program sustainability?
- How did partners communicate and coordinate their activities?
- What factors contributed to partners’ involvement or lack of involvement in Coalition efforts? Which contributions from partners were most critical to the success of the grant program? Which contributions from partners had less of an impact?
- How effective was the website at serving as a communication hub for the initiative?

What was the nature of outreach to and assessment of eligible participants?
- What effective strategies did Coalition colleges use to recruit eligible participants? What were the characteristics of those engaging in each of the M-CAM training programs?
- What role did Michigan Works! play in referring potential students to the program?
- Were in-depth assessments of participants’ abilities, skills, and interests conducted to select participants into the grant program? Who conducted the assessments? Were the assessment results useful in determining the appropriate programs and course sequences for participants?
- What strategies or methods did colleges use to assess prior learning?
- What role did career counselors and other intake staff play in helping to identify stacked educational pathways for students? Was career guidance provided? If so, through what methods?
How was each of the initiative’s major components developed and launched?

- How were programs and program designs improved or expanded using grant funds? What delivery methods were offered?
- How was the particular curriculum selected, used, and/or created?
- What lessons were learned during the development and expansion of key programs?
- What influence did the career service model and Educational Development Plans (EDPs) have on students’ educational experiences?
- What support services were offered?
- What work-based learning opportunities were developed? How did WBL opportunities differ across Coalition colleges?
- What technology-enabled courses (MOOCs, Mobile Labs, etc) were developed? How did these courses expand educational pathways and opportunities for students?
- What services were offered by job search and placement programs? What role did Michigan Works! play in facilitating job search and placement?
- How did Coalition colleges link to other educational institutions? What influence did these linkages have on students’ experience?

What were the initiative’s outputs?

- What new programs of study were developed and which of these will be sustained after grant funding expires? What new curricula were disseminated beyond the Coalition?
- How satisfied were students with various components of the M-CAM program?
- What were employers’ assessments of the skills of the students they hired?
- What factors contributed to the success of the grant initiative overall?

Outcomes Study

What were the enrollment outcomes of M-CAM programs?

- How many participants were enrolled in each of the M-CAM training programs?
- How many participants actually completed their programs during the study period? How many completed required numbers of credits and sequences of courses?
- How many individuals discontinued their studies before program completion?

What were the educational outcomes of M-CAM participants?

- How many participants earned credentials? What different credentials did they earn?
- How many M-CAM completers enrolled in further education?

What were the employment outcomes of M-CAM participants?

- How many M-CAM participants were employed after program completion?
- How many were retained in employment?
- What were the average earnings of M-CAM participants?
- For incumbent workers, what wage gains did they obtain?
Impact Study

- After controlling for baseline characteristics, are there statistically significant differences between students in the treatment and comparison groups in terms of credit hours earned, program/certificate completion, transition to further educational programs (to the extent this is reliably captured across partner colleges), employment, and earnings after exit?
- Does the size of the impact vary by socio-demographic characteristics or program of study?
- How do impacts vary for students in each of the three types of programs of study?

Detailed Data Sources

<table>
<thead>
<tr>
<th>Data Source</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Efforts To Outcomes (ETO) Database</td>
<td>ETO is used to track student characteristics, services received, and outcomes. The M-CAM program staff members at each college regularly enter data into ETO. As of July 6, 2016, the ETO system had a total of 2,923 students enrolled in M-CAM.</td>
</tr>
<tr>
<td>Unemployment Wage data from State of Michigan</td>
<td>SPR received wage data on 2733 participants, from Quarter 1 of 2012 through Quarter 2 of 2016. We also received and analyzed the North American Industry Classification (NAIC) codes for all participants, which provide insight into the types of jobs that participants have been placed into. Note that SPR is missing Social Security Numbers (SSNs) for 94 participants. Another 197 M-CAM participants do not have any wages in the Michigan UI system.</td>
</tr>
<tr>
<td>Site Visits</td>
<td>Each site visit entails interviews with M-CAM college presidents, program staff members, faculty members, student support counselors, job development and placement staff members, employer partners, workforce development partners (Michigan Works!), and other community partners. SPR also conducts focus groups with students and observes classroom activities while on-site. SPR has conducted three out of four planned rounds of multi-day site visits to each of the colleges. Visits were conducted in fall 2014, spring 2015, and spring 2016. A final set of visits is scheduled for spring 2017.</td>
</tr>
<tr>
<td>Student Exit Surveys</td>
<td>The student exit survey gathers students’ perspectives on the quality of the supportive services and training they received, as well as information about whether they received a job in their field of training and the wages they are earning. The survey is administered to completers and non-completers once every quarter. Thus far, 350 students have completed the student exit survey.</td>
</tr>
<tr>
<td>Data Source</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Student Case Studies</td>
<td>The purpose of the case studies is to gather in-depth information from students about their experiences with receiving training in the M-CAM pathways. SPR has conducted 22 case study interviews with student participants in M-CAM during the first of two rounds of case study interviews.</td>
</tr>
<tr>
<td>Participant Observation of Consortium Meetings</td>
<td>The SPR evaluation team participates in regular consortium meetings, including monthly conference calls, strategy and operations meetings, two full grantee meetings per year, and other meetings in the targeted industry areas. Thus far, SPR has participated in at least 42 consortium meetings outside the context of site visits.</td>
</tr>
<tr>
<td>Web-based surveys and feedback forms</td>
<td>Web-based surveys of M-CAM program managers and staff members allow us to assess satisfaction with communication, collaboration, and progress towards meeting consortium goals. Two web-based surveys have been conducted so far. The feedback forms allow us to gather data on how consortium activities and workshops went; the data from these forms are analyzed to provide guidance to the consortium leadership.</td>
</tr>
<tr>
<td>Other tools</td>
<td>Several data collection tools (a fidelity tool, checklists, and an employer engagement spreadsheet) enable us to assess and describe consortium structure, courses, and progress towards consortium goals at the time of each site visit. The data collected with these tools will allow us to track changes in these aspects of the initiative.</td>
</tr>
</tbody>
</table>
Appendix B: Online Learning Communities

One goal of the M-CAM TAACCCT grant was improving online and technology-enabled learning opportunities for key stakeholders by developing online learning communities. The M-CAM consortium has successfully developed an online learning community. This section provides a brief description of the online learning community and a few challenges encountered by the M-CAM consortium.

Process for Developing the Online Learning Community

Beginning in September 2015, Kellogg’s Information Technology staff worked closely with representatives from the other M-CAM colleges, including faculty and M-CAM program managers, to develop a charter and identify the goals for the online learning community site. Once a team was in place, the team spent October through December 2015 researching platforms and solutions for the online learning communities. Goals identified for the online learning communities was ensuring the site is interactive and available to faculty and M-CAM program staff to engage with one another, share content and ask questions and that it is user-friendly and easy to navigate.

In December 2015, the team selected a third-party vendor, Higher Logic, to help them develop an online learning community platform and interface for the M-CAM consortium and its other identified users. The initial build of the site was completed in March 2016. The site is currently undergoing beta-testing with faculty and M-CAM program managers to address functionality issues and to identify appropriate content for the site. The M-CAM consortium hopes to actively market the site to a broader community over the remaining months of the M-CAM TAACCCT grant to onboard users, generate engagement among faculty and improve the online platform and environment.

Online Learning Community Platform

M-CAM has a live and functioning Online Learning Community, which is available at www.engage.m-cam.org.
The site is maintained by High Logic and is hosted on a secure Amazon Cloud environment. Every user on the site must request an account and go through an authentication process in order to obtain site access. One interested component of the site is that each M-CAM community is built from the same shell/framework, so the look and feel for each is similar.

The M-CAM online learning community works like any other social media site with individual profiles, discussion posts, shared files, directory and the ability to ask questions and receive feedback. In order to increase engagement, the M-CAM consortium made sure the site is mobile device compatible. The content on the site is user driven, which means it must be generated and updated by M-CAM staff, faculty, employers and students that are users of the system.

The M-CAM consortium has built eight online communities using the baseline template created by the consortium. Each M-CAM community is built on an established framework comprised of four components: Community Home Page, Discussion, Library, and Members.
As already stated, the M-CAM consortium has developed eight online learning communities. These communities represent a general community to which all users belong as well as separate communities for each of the four M-CAM career pathways; these are available to the public. In addition to the five public access communities, there are three internal M-CAM communities that are invite only.

The M-CAM wide communities are visible to authenticated site users and can be joined at their own accord/interest. In addition to these larger online communities, the M-CAM consortium decided to create internal online communities to allow grant staff and faculty to share best practices and knowledge related to the workings on the grant in a non-public format. These communities are not visible to the general M-CAM population and users get access via invitation only.

**Challenges with Developing Online Learning Community**

As the lead college, Kellogg staff reported a number of challenges in developing the online learning community. First off, many of the M-CAM project management staff and faculty are being tasked with working on multiple pieces of the TAACCCT grant, which limits their availability and time to devote to the online technology component. As a result, the M-CAM consortium has experienced a number of delays in launching this component of the grant. This was one of the reasons the M-CAM consortium decided to contract with a third-party vendor on developing the online learning communities.

Another major challenge with the online learning communities is engaging faculty and staff in using the site to share ideas and content. According to the Kellogg’s project director, “Engagement is key to success and must be end-user driven.” To address this concern, Kellogg and their technical support provider, Corporation for a Skilled Workforce (CSW), have engaged the other M-CAM colleges in discussions about the site. To encourage sign-ups, the M-CAM consortium has created individuals website links that can be used by college and program promotions staff for outreach materials, course syllabi, course intake and enrollment forms to advertise the site and encourage different partners to use the site to engage one another (e.g., engage.m-cam.org/signup/bay).
## Appendix C: Progress Toward DOL Outcomes as of 7/31/2016

<table>
<thead>
<tr>
<th>DOL Outcome</th>
<th>Number of Participants</th>
<th>% of DOL Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Total Unique Participants Served</td>
<td>3,042</td>
<td>111%</td>
</tr>
<tr>
<td>2. Total Number of Participants Completing a TAACCCT Funded Program</td>
<td>1,547</td>
<td>96%</td>
</tr>
<tr>
<td>2a. Total Number of Participants Completing a TAACCCT Funded Credit Program</td>
<td>477</td>
<td>n/a</td>
</tr>
<tr>
<td>2b. Total Number of Participants Completing a TAACCCT Funded Non-credit Program</td>
<td>1,076</td>
<td>n/a</td>
</tr>
<tr>
<td>3. Total Number Still Retained in a TAACCCT Funded Program</td>
<td>1,311</td>
<td>110%</td>
</tr>
<tr>
<td>4. Total Number of Participants Completing Credit Hours</td>
<td>1,612</td>
<td>121%</td>
</tr>
<tr>
<td>5. Total Number of Participants Earning Credentials</td>
<td>1,720</td>
<td>85%</td>
</tr>
<tr>
<td>5a. Total Number of Participants Earning Credentials (Awarded by College)</td>
<td>1,547</td>
<td>n/a</td>
</tr>
<tr>
<td>5b. Total Number of Participants Earning Credentials (Awarded by an industry group)</td>
<td>550</td>
<td>n/a</td>
</tr>
<tr>
<td>6. Total Number of Participants Enrolled in Further Education After TAACCCT Completion</td>
<td>319</td>
<td>130%</td>
</tr>
<tr>
<td>7a. Total Number of Participants Employed After TAACCCT Exit</td>
<td>595</td>
<td>37%</td>
</tr>
<tr>
<td>7b. Total Number of Participants Employed During Enrollment or Quarter After TAACCCT Exit</td>
<td>1,110</td>
<td>n/a</td>
</tr>
<tr>
<td>8. Total Number of Participants Retained in Employment After Program Completion</td>
<td>332</td>
<td>25%</td>
</tr>
<tr>
<td>9. Total Number of Incumbent Worker Participants Who Received a Wage Increase</td>
<td>1,033</td>
<td>287%</td>
</tr>
</tbody>
</table>
## Appendix D: College Certificates, Associate’s Degrees, and Professional Credentials Earned

<table>
<thead>
<tr>
<th>College</th>
<th>Career Pathway</th>
<th>No. Earning College Certificate</th>
<th>No. Earning Associate’s Degree</th>
<th>Type of Professional Credential</th>
<th>No. Earning Professional Credential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bay</td>
<td>Unknown</td>
<td>1</td>
<td>0</td>
<td>American Welding Society (AWS)</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Multi-Skilled Technician/Mechatronics</td>
<td>2</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Welding/ Fabrication</td>
<td>38</td>
<td>0</td>
<td>American Welding Society (AWS)</td>
<td>51</td>
</tr>
<tr>
<td>Grand Rapids</td>
<td>CNC Machining</td>
<td>72</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Multi-Skilled Technician/Mechatronics</td>
<td>108</td>
<td>5</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Production</td>
<td>104</td>
<td>0</td>
<td>Forklift Certification</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>OSHA 30</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Other</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Welding/ Fabrication</td>
<td>89</td>
<td>14</td>
<td>Other</td>
<td>2</td>
</tr>
<tr>
<td>College</td>
<td>Career Pathway</td>
<td>No. Earning College Certificate</td>
<td>No. Earning Associate's Degree</td>
<td>Type of Professional Credential</td>
<td>No. Earning Professional Credential</td>
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</tr>
<tr>
<td>Kellogg</td>
<td>Unknown</td>
<td>1</td>
<td>0</td>
<td>Forklift Certification</td>
<td>78</td>
</tr>
<tr>
<td></td>
<td>CNC Machining</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Multi-Skilled Technician/Mechatronics</td>
<td>6</td>
<td>0</td>
<td>Forklift Certification</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Production</td>
<td>191</td>
<td>0</td>
<td>American Welding Society (AWS)</td>
<td>6</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Forklift Certification</td>
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<td>OSHA 30</td>
<td>10</td>
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<tr>
<td></td>
<td>Welding/Fabrication</td>
<td>60</td>
<td>3</td>
<td>American Welding Society (AWS)</td>
<td>4</td>
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<tr>
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<td></td>
<td></td>
<td></td>
<td>Forklift Certification</td>
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</tr>
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<td>Lake Michigan</td>
<td>CNC Machining</td>
<td>46</td>
<td>5</td>
<td>American Welding Society (AWS)</td>
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</tr>
<tr>
<td></td>
<td>Multi-skilled</td>
<td>6</td>
<td>7</td>
<td>American Welding Society (AWS)</td>
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