

MARICOPA COUNTY COMMUNITY COLLEGE DISTRICT  
MESA COMMUNITY COLLEGE  
ARIZONA ADVANCED MANUFACTURING INSTITUTE

**Third-Party Evaluation Services for the  
Trade Adjustment Assistance Community College  
and Career Training Grant**

***Final Report***

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## EXECUTIVE SUMMARY

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### 1. Introduction

The U.S. Department of Labor's (DOL) Trade Adjustment Assistance Community College and Career Training (TAACCCT) grant program allowed community colleges and other eligible higher education institutions to use federal funds to expand and improve their education and career training programs. These programs targeted workers whose jobs were directly affected by foreign trade and who were eligible for training under the Trade Adjustment Assistance (TAA) workers program. The grants provided funds for training and employment in high-wage, high-skill occupations to TAA-eligible workers as well as a broad range of other adults, such as women or minorities, who may be underrepresented in high-demand fields.

In 2013, Mesa Community College (MCC), in the Maricopa County Community College District, was awarded a third-round TAACCCT grant to implement the Arizona Advanced Manufacturing Institute (AzAMI) program. The AzAMI program was designed to develop, improve, and expand educational training for careers in the aerospace and advanced manufacturing industries. The targeted occupations included in the grant application were seen as well suited to TAA-impacted workers and other adults who wanted to train for a middle-wage job. The major AzAMI program activities/components implemented to serve this population included:

- Creating an awareness program to highlight career opportunities in aerospace and advanced manufacturing for students and job seekers in general as well as for workers eligible for TAA in the Greater East Valley region;
- Developing new curricula, including boot camps, to better prepare students and provide opportunities to earn stackable or latticed credentials and advance along the manufacturing career pathway;
- Updating and aligning curricula and labs to better prepare students, provide industry-recognized stackable or latticed credentials, and make use of new equipment and industry techniques;
- Providing faculty with professional development opportunities to enable them to incorporate new equipment and credentials into their courses;
- Involving industry partners in program development and participant placement to make the program more responsive to industry needs; and
- Hiring and training a specialized career navigator to provide program and career advising services and conduct participant tracking.

Several key components of the AzAMI program are supported by the workforce development literature. The literature demonstrates that the major AzAMI program components are based on strong evidence and promising practices identified in the field of workforce development.

The overarching framework of AzAMI is the development of manufacturing career pathways with stackable credentials. While the career pathways model is relatively new in the field of workforce development, there is emerging evidence to support its effectiveness in contributing to positive education and employment outcomes.<sup>1,2,3</sup>

Employer engagement is a new, foundational aspect of AzAMI as a sector strategy and was a primary objective of the grant. There is a strong body of evidence supporting the value and effectiveness of employer engagement in developing a well-prepared workforce. Research in this area highlights the importance of effectively engaging employers<sup>4</sup> and customizing training programs to meet their needs.<sup>5</sup>

Another key component of AzAMI is career navigator services to provide both academic and non-academic supports. The research highlights the importance of non-academic supports in the community college environment to improve outcomes.<sup>6</sup> The research evidence suggests that intensive advising services can play an important role in helping students navigate the community college environment and achieve improved academic outcomes.

The findings from the AzAMI program evaluation will help build the evidence base for career pathway initiatives and expand the evidence base related to employer engagement and career navigator roles. In so doing, the evaluation highlights specific practices and approaches for successfully implementing workforce development initiatives that will help inform the development of future programs.

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<sup>1</sup> The San Diego County Bridge to Employment in the Healthcare Industry Program: Implementation and Early Impact Report: Pathways for Advancing Careers and Education. OPRE Report 2017-41. Washington, DC: Office of Planning, Research and Evaluation, Administration for Children and Families, U.S. Department of Health and Human Services, p. ii.

[https://www.acf.hhs.gov/sites/default/files/opre/bridge\\_to\\_employment\\_implementation\\_and\\_early\\_impact\\_report\\_final\\_pdf.pdf](https://www.acf.hhs.gov/sites/default/files/opre/bridge_to_employment_implementation_and_early_impact_report_final_pdf.pdf)

Gardiner, K., Rolston, H., Fein, D., Cho, D. and S. (2017). Pima Community College Pathways to Healthcare Program: Implementation and Early Impact Report, OPRE Report No. 2017-10. Washington, DC: Office of Planning, Research and Evaluation, Administration for Children and Families

[https://www.acf.hhs.gov/sites/default/files/opre/pathways\\_to\\_healthcare\\_implementation\\_and\\_early\\_impact\\_report\\_final\\_4.pdf](https://www.acf.hhs.gov/sites/default/files/opre/pathways_to_healthcare_implementation_and_early_impact_report_final_4.pdf)

<sup>2</sup> U.S. Departments of Labor, Commerce, Education, and Health and Human Services (July 22, 2014). What Works in Job Training: A Synthesis of the Evidence. <https://www.dol.gov/asp/evaluation/jdt/jdt.pdf>

<sup>3</sup> Symonds, W.C., Schwartz, R. & Ferguson, R.F. (2011). Pathways to Prosperity: Meeting The Challenge of Preparing Young Americans for the 21st Century. Cambridge, MA: Pathways to Prosperity Project, Harvard University Graduate School of Education.

<sup>4</sup> Manufacturing Institute and University of Phoenix (2011). Manufacturing Skills Certification: Employer Perspectives. Phoenix, AZ: University of Phoenix. Retrieved from:

<http://www.themanufacturinginstitute.org/~media/1B429DD80E684BA5AEFAC18DD27C71C7.ashx>

<sup>5</sup> Maguire, S., Freely, F., Clymer, C., Conway, M., & Schwartz, D. (2010). Tuning In to Local Labor Markets: Findings from the Sectoral Employment Impact Study. Philadelphia: Public/Private Ventures.

<sup>6</sup> Karp, M. (2011). Toward a New Understanding of Non-Academic Student Support: Four Mechanisms Encouraging Positive Student Outcomes in the Community College. CCRC Working Paper No 28. New York: Columbia University, Teachers College, Community College Research Center, p. 23.

<http://files.eric.ed.gov/fulltext/ED516148.pdf>

## 2. Evaluation Design

Under the terms of the TAACCCT grant, grantees were required to engage a third-party independent evaluator to evaluate the grant initiative. In February 2014, MCC awarded IMPAQ International, LLC (IMPAQ) a contract to serve as its third-party evaluator. In the evaluation, IMPAQ conducted a qualitative implementation study and a quantitative outcomes study of the AzAMI program participants. The evaluation of the AzAMI program addressed research questions that focus on implementation successes, challenges, and lessons learned, and on participant outcomes.

The **implementation study** focused on the design, administration, operation, services, and outcomes of the program as laid out in the program's logic model. It also explored implementation challenges and promising practices that could be replicated in other settings. To address the research questions associated with the implementation study, the evaluation team collected data during site visits that consisted of semi-structured key informant interviews and participant focus groups. The team also conducted regular program check-ins and an extensive review of relevant program documents. The team used the program logic model to develop all data collection tools, which included questions focusing on program inputs, activities, outputs, and outcomes, and specifically on how the inputs and activities enabled AzAMI program to expand its program offerings and develop strong relationships with community stakeholders.

At the conclusion of the site visits and again following the regular check-in meetings, the team analyzed the interview notes and documented the significant themes related to program challenges, lessons learned, and best practices.

The **outcomes analysis** examined the demographic characteristics, academic behavior, and academic awards earned by the participants. The outcomes analysis is correlational, not causal, but lays important groundwork for further causal research. It provides a comprehensive picture of student demographics and program characteristics such as course load, credit hours earned, enrollment semester, program of study, number of visits with the career navigator, program completion, and industry certificates, certificates of completion, and associate degrees earned. In this study, *the treatment group is defined to include all students who participated in the AzAMI program during the grant period of performance. The comparison group consists of MCC students who matched the AzAMI students' age and educational levels and who took at least one AzAMI course during the same period.*

The outcomes analysis examined progress made towards the program's educational outcomes during the grant period of performance (Fall 2014 through Spring 2017). Data for the analysis were collected from the MCC Office of Institutional Effectiveness academic records, the AzAMI participant database, and student applications to the AzAMI program. The quantitative analysis consisted of a descriptive analysis and a multivariate regression analysis.



### **3. Implementation Study Findings**

MCC has achieved many of its goals for the AzAMI program by successfully leveraging highly qualified program faculty and staff to improve course offerings and student supports, developing and implementing boot camps, and conducting extensive program outreach to foster and build relationships with industry and other program stakeholders. AzAMI staff and program faculty have made significant efforts to build and leverage strong partnerships with economic development agencies, the workforce development system, education and training providers, employers, and industry organizations. These partnerships have led to a broader outreach and recruitment effort, improved and expanded course offerings, more hands-on learning opportunities, and opportunities for student placement and employment. AzAMI's strong relationships with industry and program stakeholders will also help ensure the sustainability of the program.

AzAMI staff exceeded the specific recruitment and outcome goals laid out in the MCC grant application. Of note, AzAMI served a total of 463 participants, about 60 percent more than the goal of 290. A total of 218 participants completed a TAACCCT program of study, and earned credentials—12 more participants than the target for each goal (206).

As with all new programs, challenges with implementation were encountered, but AzAMI program staff made progress in addressing them. For example, students noted frustration with the inability to earn college credit toward their program of study through boot camps. AzAMI modified the program so that boot camp participants can now receive prior learning credits toward their program of study. Another challenge, reported by program faculty and staff, was that in some cases it was difficult to accurately gauge employer demand for specific skill sets during the short start-up phase of the grant, though real-time adjustments were made to program plans to account for any miscalculations.

Despite these challenges, the AzAMI program appears to be providing education and training that prepares students to meet industry skill needs, and program staff have successfully developed a sustainability plan to maintain the most successful components of the program going forward.

### **4. Outcome Study Findings**

Descriptive program data on AzAMI program characteristics indicate that the program has matured over time. For example, students increased their use of career navigator services in later program years (from 8 visits on average in grant year 2, to 14 visits on average in grant year 3). In addition, over the course of the grant period, the program enrolled more students from the larger Mesa community, rather than just from the pool of current and former MCC students.

Moreover, AzAMI students who completed the program (“completers”) displayed different academic behavior than those who left the program (“exiters”). For example, completers met

with the career navigator more than twice as often and earned over twice as many credit hours in AzAMI courses on average as exiters. Over half of exiters quit the AzAMI program after completing one semester or less in AzAMI courses. This indicates that the experience of the first semester is critical in a student's pathway. Pre-participants showed even less attachment to the AzAMI program than exiters. Pre-participants earned the lowest number of credit hours at AzAMI, and none used career navigator services in a systematic manner.

The outcomes study used regression modeling to compare educational outcomes between the AzAMI participants (treatment group) and a comparison group composed of other similar MCC students. The comparison group was constructed to reflect the education, age, enrollment timeframe, and career interests of the AzAMI participant group. In three of four regression models, the team found that students in the AzAMI program were more likely to complete their program and earn an award. Compared to the comparison group, AzAMI students were 16 percent more likely to earn an associate degree or certificate of completion, 11 percent more likely to earn a certificate of completion, and 30 percent more likely to earn any MCC award (associate degree, certificate of completion, or industry certificate). Each of these results was statistically significant at a p-value of at least 5 percent.

## 5. Study Limitations and Directions for Future Research

The outcome study could not capture various factors that may reflect unmeasured differences between the two groups. The findings of this correlational study point to a need for a more in-depth investigation to identify the precise, causal effects of the AzAMI program on both educational and employment outcomes. The team was unable to evaluate the effect of the TAACCCT-funded AzAMI program on employment and earning outcomes because individual-level data on quarterly wages and employment could not be obtained from the Arizona Department of Economic Security, Unemployment Insurance Administration. Future research should consider obtaining data on labor market outcomes.

This outcome study showed a higher positive association between the AzAMI participants and earned awards relative to the comparison group. However, the positive association may be due to unmeasured differences between the individuals in the participant group and those in the comparison group. For instance, if the AzAMI participants were more motivated and committed than the comparison group members, then some or all of the positive association between the treatment group and educational outcomes may be due to these unmeasured characteristics. On the other hand, the positive association may also point to the program having a positive impact on educational outcomes. Due to the following limitations in the data, the "true" causal effect of the program could not be measured:

- **Lack of an appropriate comparison group due to the intensive intake process at AzAMI:** Rigorous evaluations require comparing actual and counterfactual outcomes, that is, comparing how the individual would have fared in the absence of the program or intervention. But since an individual can be identified in only one state at a point in time, it becomes crucial to identify a comparison group that is *observationally similar* to the

treatment group. However, the participants in the AzAMI program were selected from among a group of pre-participants. Those who met the program's stringent criteria showed continuous persistence towards program goals. A causal impact evaluation would require the comparison group to be chosen based on similar criteria, or be able to meet such criteria. In absence of such a group that would allow for a more "apples to apples" comparison, the evaluation team could not causally estimate program impacts.

- **Lack of sufficient data on demographic and socioeconomic outcomes:** Some impact evaluation techniques, such as propensity score matching, require sufficient baseline demographic and socioeconomic characteristics to create a comparison group that closely resembles the treatment group. Lack of sufficient data on such characteristics can be a serious impediment to conducting such impact evaluations with any degree of certainty. In this study, while the evaluation team had access to a rich number of baseline characteristics, including employment and wage rate at the time of application, insufficient baseline data on the comparison group were available to produce more rigorous estimates.

## 6. Conclusion

This report discusses the key lessons learned and the implications of the evaluation findings to aid in the planning and implementation of similar grant programs in the future. The following conclusions were drawn from the implementation and outcome studies:

- **The first semester at AZAMI is critical to determining a student's pathway.** This finding also highlights the importance of ensuring that new students have appropriate expectations for their academic program and addressing any barriers to success from the start.
- **Program partnerships with community stakeholders are key to success.** Program implementers should use a wide range of engagement methods, as the AzAMI program did, to develop strong partnerships with community stakeholders.
- **A strong team of staff, well versed in building lasting relationships with community stakeholders, is needed.** AzAMI's success in this area points to the necessity of having grant staff in place who are skilled and experienced in building strong relationships with community stakeholders from the start of the grant.
- **Course availability/scheduling can be challenging when expanding a program.** Program implementers should expect such issues when expanding their program offerings and take early steps to mitigate them.
- **Commitment to supporting student success through individualized support adds value.** Program implementers should consider how they can offer services similar to those provided by the career navigator to both engage new participants and support existing participants.
- **Short-term training options offer students the skills they need to find work and meet the skill needs of employers.** Program implementers should work with local employers

to develop short-term training opportunities for students. As the AzAMI program found, offering college credit for participation will likely keep students engaged in the program and will contribute to the program's sustainability.

- **Implementing the program with the support and buy-in of the operating institution is essential.** AzAMI program management reported that the support and buy-in of the MCC was essential in the program's ability to build strong relationships with community stakeholders and leverage additional resources to help grow and sustain the program.
- **Piloting new online learning/software programs allows for adjustments to be made.** New software or online learning tools should be piloted before they are implemented program-wide. Program staff and students can provide useful feedback on the usability and functionality of such software programs, which should be used to inform decisions about whether to fully adopt the software/tool or identify alternative options.
- **Leveraging additional resources throughout the life of the grant helps support and expand grant activities and ensure sustainability.** Grant staff in future programs should follow the lead of AzAMI and work to leverage additional grant resources throughout the grant period.

## 1. INTRODUCTION

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The U.S. Department of Labor's (DOL) Trade Adjustment Assistance Community College and Career Training (TAACCCT) grant program was designed to allow community colleges and other eligible higher education institutions to use federal funds to expand and improve their education and career training programs. These programs targeted workers whose jobs were directly affected by foreign trade and who were eligible for training under the Trade Adjustment Assistance (TAA) workers program. The grant provided funds for training and employment in high-wage, high-skill occupations to TAA-eligible workers as well as a broad range of other adults, such as women or minorities, who may be underrepresented in high-demand fields.

In 2013, Mesa Community College (MCC), in the Maricopa County Community College District, was awarded a third-round TAACCCT grant to implement the Arizona Advanced Manufacturing Institute (AzAMI) program. The AzAMI program was designed to develop, improve, and expand educational training for careers in the aerospace and advanced manufacturing industries by:

- Developing innovative learning strategies,
- Creating stackable credentials,<sup>7</sup>
- Bringing labs and curricula up to nationally recognized industry certification levels (NIMS I and II),
- Providing education and training to enable students to receive nationally recognized industry certifications,
- Developing new curricula to enhance existing programs, including boot camps that review relevant skills, assessing participants' ability to qualify for credentials, and identifying paths for further training, if needed, and
- Creating experiential learning, job placement, and employment opportunities.

Under the terms of the TAACCCT grant, grantees were required to engage a third-party independent evaluator to evaluate the grant initiative. In February 2014, MCC awarded IMPAQ International, LLC (IMPAQ) a contract to serve as the third-party evaluator of its TAACCCT grant. In the evaluation, IMPAQ conducted a qualitative implementation study and a quantitative outcomes study of the AzAMI program participants. The *implementation study* focused on the design, administration, operation, services, and outcomes of the program. It also explored implementation challenges and promising practices that could be replicated in other settings. The *outcomes analysis* examined the demographic characteristics, academic behavior, and academic awards earned by the participants.

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<sup>7</sup> "A credential is considered stackable when it is part of a sequence of credentials that can be accumulated over time to build up an individual's qualifications and help them to move along a career pathway or up a career ladder to different and potentially higher-paying jobs." U.S. Department of Labor, "Credential Resource Guide," Training and Employment Guidance Letter 15-10, Attachment 2, December 15, 2010.

Over the course of the evaluation period (March 2014–September 2017), IMPAQ prepared three reports for MCC that document the study’s findings: a continuous feedback report, an interim evaluation report, and a final evaluation report. In January 2015, IMPAQ submitted the continuous feedback report, which provided descriptive information and feedback on program implementation derived from data available early in the program’s period of performance. The interim evaluation report, submitted in October 2016, presented a status update on the AzAMI implementation midway through the period of program performance. This final evaluation report, prepared at the end of the evaluation period, summarizes the findings from the implementation study and the outcome study.

The report provides an overview of the AzAMI program and describes how the program was implemented from grant start-up to close-out. It highlights the successes, challenges, and lessons learned as identified by the evaluation team and by program staff and stakeholders. The implementation findings provide important context for the outcomes study. The outcomes study offers an assessment of AzAMI program on participants’ educational and labor market outcomes.

Chapter 2 of the report presents the program’s logic model, a brief overview of the AzAMI program, and a discussion of the evidence base for the AzAMI intervention. Chapter 3 describes the evaluation team’s methodology for the implementation and outcomes studies. Chapter 4 presents the implementation study findings. Chapter 5 discusses the characteristics of the AzAMI program, and Chapter 6 presents the outcomes study findings. Finally, Chapter 7 discusses the implications of the evaluation findings.

## 2. AzAMI PROGRAM OVERVIEW

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At the time of the grant award, significant job growth and job openings were anticipated in the advanced and aerospace manufacturing industries in the metropolitan Phoenix area. Projections indicated 10,149 new jobs in these targeted industries and 3,126 new jobs in the targeted occupations between 2010 and 2020.<sup>8</sup> These projections were based on job and industry growth, but additional openings were expected as a result of turnover and retirements. The targeted occupations included in the grant application were seen as well suited to TAA-impacted workers and other adults who wanted to train for a middle-wage job (the mean hourly wage across occupations was \$21.71 in the Phoenix area in 2012<sup>9</sup>).

MCC realized that it had a number of gaps in its training and education programs that created barriers for students wishing to enter the advanced manufacturing workforce and progress along the manufacturing career pathway.<sup>10</sup> To meet the growing demand for industry certificates and stacked credentials, MCC identified the following specific gaps in its training and education pathways:

- A lack of capacity to deal with student and employer demand;
- Limited professional development opportunities for faculty that hindered MCC's ability to offer new industry certifications and train students to use new equipment;
- Outdated and disconnected curricula that did not address the latest industry equipment or in-demand industry certifications;
- Limited and outdated equipment; and
- Limited accelerated education/training options for students who want to enter the workplace as soon as possible with industry certifications.

The AzAMI program sought to address these gaps and applied for the TAACCT grant program as a means to improve, enhance, and accelerate the educational training that its students needed for high-demand careers in advanced and aerospace manufacturing. The program's design and evidence-based activities incorporate the six core TAACCCT elements.<sup>11</sup> This design aligns MCC's education and training programs with the growing demand for workers with advanced manufacturing skills and credentials in a set of core programs of study: electronics, drafting, automation and machining, and welding. The specific activities undertaken to address the identified gaps are discussed in section 2.1 below.

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<sup>8</sup> MCC grant application.

<sup>9</sup> Ibid.

<sup>10</sup> Ibid.

<sup>11</sup> The six core elements required of TAACCCT grants are (1) evidence-based design, (2) stacked and latticed credentials, (3) transferability and articulation of credit, (4) advanced online and technology-enabled learning, (5) strategic alignment, and (6) alignment with previously funded TAACCCT projects.

## 2.1 Program Logic Model

Exhibit 2.1 presents the AzAMI logic model, which illustrates the program's inputs and activities, measures, outcomes, and impacts to be achieved during the life of the grant. The main program inputs include grant funding, equipment, staff, local employers and industry representatives, and service providers, all of which have been utilized to implement AzAMI. The project's activities, outputs, and outcomes are described below.

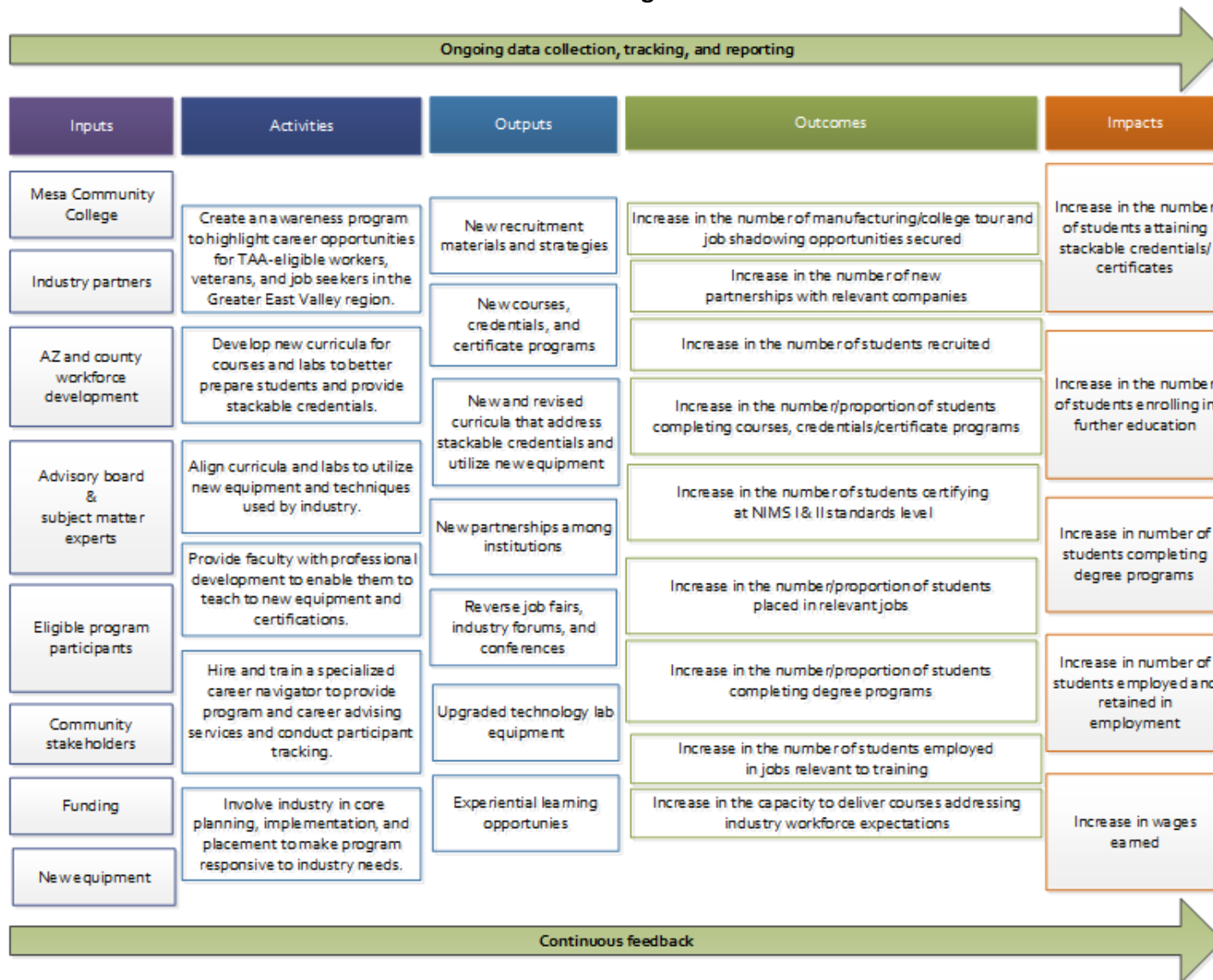
The project activities included:

- Creating an awareness program to highlight career opportunities in aerospace and advanced manufacturing for students and job seekers in general as well as for workers eligible for TAA in the Greater East Valley region;
- Developing new curricula, including boot camps, to better prepare students and provide opportunities to earn stackable or latticed credentials and advance along the manufacturing career pathway;
- Updating and aligning curricula and labs to better prepare students, provide industry-recognized stackable or latticed credentials, and make use of new equipment and industry techniques;
- Providing faculty with professional development to enable them to incorporate new equipment and credentials into their courses;
- Involving industry partners in program development and participant placement to make the program more responsive to industry needs; and
- Hiring and training a specialized career navigator to provide program and career advising services and conduct participant tracking.

Key outputs from program activities include new recruitment materials and strategies; new and revised curricula that address stackable credentials and make use of new equipment; new courses, credentials, and certificate programs; upgraded technology/lab equipment; effective industry and employer partnerships; and experiential learning and job placement opportunities.



**Exhibit 2.1: Logic Model**



Outcomes are the effects of the program outputs. Expected outcomes of the AzAMI program as laid out in the grant application include the following:<sup>12</sup>

- Increases in the number of students recruited for, enrolling in, and completing TAACCCT-funded program courses and credential/certificate programs;
- Increases in the number of students employed a in job relevant to their training; and
- Increased capacity of instructors to teach courses according to industry expectations.

Potential participant impacts include increased employment in advanced manufacturing jobs, attainment of relevant credentials and certificates for career advancement, enrollment in further education, and increases in wages. Examining program impacts involves measuring the degree to which the outcomes observed are attributable to the activities and outputs of the program. Impacts were not measured as part of this evaluation because of study constraints, including lack of an appropriate comparison group and access to data.

## **2.2 Evidence Base for the AzAMI Intervention**

Several key components of the AzAMI program are supported by the workforce development literature. The evaluation findings presented in this report build on this literature and expand the evidence base related to the effectiveness of each of the program components.

This section presents the findings from a literature review that examined the evidence base for the following program areas: career pathways, employer engagement, and career navigators. For each area, we provide a synopsis of the evidence supporting the associated program interventions and describe how the evaluation built on this evidence base.

### **2.2.1 Career Pathways**

The overarching framework of AzAMI is the development of manufacturing career pathways with stackable credentials. A major component of this effort has been to incorporate into existing training programs industry-recognized credentials, including NIMS certifications, that reflect the skill needs of employers.

Supporting Evidence. The career pathways model is relatively new in the field of workforce development, and therefore the effectiveness of the model and its components are just starting

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<sup>12</sup> Outcomes on employment and earnings are not included in the evaluation, because individual-level data on quarterly wages and employment could not be obtained from the Arizona Department of Economic Security, Unemployment Insurance Administration.

to be rigorously evaluated.<sup>13,14</sup> Pathways for Advancing Careers and Education (PACE), a 10-year, nine-site random assignment study of career pathway programs, supported by the U.S. Department of Health and Human Services (HHS), has had positive early results.<sup>15</sup> The two sites with early impact evaluation results (San Diego and Tucson) are healthcare career ladder programs that enable participants to earn stackable credentials for high-demand healthcare jobs. At 18 months, the treatment group in both programs was more likely to have earned credentials than the control group. Another site, in South Texas, has a manufacturing career pathways track, but research results are not yet available.

A number of prior studies have found that post-secondary degrees and industry-recognized credentials contribute to positive employment outcomes. A post-secondary education, particularly a degree or industry-recognized credential related to jobs in demand, is the most important determinant of differences in workers' lifetime earnings and incomes.<sup>16</sup>

High school and college completion rates are much higher in countries that offer more diverse and robust career pathways and realistic post-secondary options.<sup>17</sup> In the United States, individuals who complete post-secondary training programs that result in professional certifications or licenses earn higher wages compared to individuals without such credentials, at each level of education below a bachelor's degree.<sup>18</sup> A government-wide review, citing literature pertaining to the labor market returns of credentials, reported that credentials related to technology, state licensure, and in-demand health occupations are associated with especially

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<sup>13</sup> Pathways for Advancing Careers and Education (PACE), 2007–2017.

<https://www.acf.hhs.gov/opre/research/project/pathways-for-advancing-careers-and-education>

<sup>14</sup> Peck, L. R., et al. (2014). Health Profession Opportunity Grants (HPOG) Impact Study Design Report.

[https://www.acf.hhs.gov/sites/default/files/opre/hpog\\_impact\\_design\\_report\\_11\\_14\\_14\\_r2\\_0.pdf](https://www.acf.hhs.gov/sites/default/files/opre/hpog_impact_design_report_11_14_14_r2_0.pdf)

<sup>15</sup> PACE programs have “well-defined training steps, promising instructional approaches targeted to adult learners, services to address academic and non-academic barriers to program enrollment and completion, and connections to employment”: Farrell, M., & Martinson, K. (2017). The San Diego County Bridge to Employment in the Healthcare Industry Program: Implementation and Early Impact Report: Pathways for Advancing Careers and Education. OPRE Report 2017-41. Washington, DC: Office of Planning, Research and Evaluation, Administration for Children and Families, U.S. Department of Health and Human Services, p. ii.

[https://www.acf.hhs.gov/sites/default/files/opre/bridge\\_to\\_employment\\_implementation\\_and\\_early\\_impact\\_report\\_final\\_pdf.pdf](https://www.acf.hhs.gov/sites/default/files/opre/bridge_to_employment_implementation_and_early_impact_report_final_pdf.pdf)

Gardiner, K., Rolston, H., Fein, D., Cho, D. and S. (2017). Pima Community College Pathways to Healthcare Program: Implementation and Early Impact Report, OPRE Report No. 2017-10. Washington, DC: Office of Planning, Research and Evaluation, Administration for Children and Families

[https://www.acf.hhs.gov/sites/default/files/opre/pathways\\_to\\_healthcare\\_implementation\\_and\\_early\\_impact\\_report\\_final\\_4.pdf](https://www.acf.hhs.gov/sites/default/files/opre/pathways_to_healthcare_implementation_and_early_impact_report_final_4.pdf)

<sup>16</sup> U.S. Departments of Labor, Commerce, Education, and Health and Human Services (July 22, 2014). What Works in Job Training: A Synthesis of the Evidence. <https://www.dol.gov/asp/evaluation/jdt/jdt.pdf>

<sup>17</sup> Symonds, W.C., Schwartz, R. & Ferguson, R.F. (2011). Pathways to Prosperity: Meeting The Challenge of Preparing Young Americans for the 21st Century. Cambridge, MA: Pathways to Prosperity Project, Harvard University Graduate School of Education.

<sup>18</sup> Ewert, S. & Kominski, R. (2014). Measuring Alternative Educational Credentials: 2012. Washington, DC: U.S. Census Bureau. <https://www.census.gov/prod/2014pubs/p70-138.pdf>

positive employment outcomes.<sup>19</sup> Moreover, a study that used data from the 2004 and 2001 panels of the Survey of Income and Program Participation (SIPP) to examine the association between educational attainment and earnings found that earnings were higher for people with sub-baccalaureate degrees in business, computer/technical, and health fields compared to those with degrees in service and education fields.<sup>20</sup>

*Building the Evidence Base.* As noted above, there is ample research to support the positive impacts of industry-recognized credentials on higher wages. The comprehensive career pathways model is a relatively new model that is beginning to build an evidence base with the HHS career pathway multi-site random experiments. The findings from those studies as well as from the AzAMI evaluation will help guide the further development of career pathways and the credentials that support them.

### 2.2.2 Employer Engagement

Employer engagement is a new, foundational aspect of AzAMI as a sector strategy and was a primary objective of the grant. The AzAMI program designed new courses, credentials, and certificate programs to be responsive to the needs of local manufacturing companies. For example, AzAMI recruited employers to participate on its program advisory committees, to provide input on the AzAMI program, curricula, and equipment purchases. AzAMI also hosted reverse career fairs, as well as placement platforms and events to help employers recruit qualified candidates.

**Supporting Evidence.** There is a strong body of evidence supporting the value and effectiveness of employer engagement in developing a well-prepared workforce. Research in this area highlights the importance of understanding the employer's perspective in order to develop an effective engagement plan that promotes the use of industry-recognized credentials. In addition, the research demonstrates that working to customize training programs to meet the needs of local employers has positive impacts on employment-related outcomes.

According to a report published by the Manufacturing Institute, industry-recognized credentials are useful tools for new-hire screening and assessment as well as for enhancing the skill sets of existing employees. The report notes the many challenges in building acceptance of such credentials and concludes that employers must create the demand for these credentials if the

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<sup>19</sup> U.S. Departments of Labor, Commerce, Education, and Health and Human Services (2014). What Works in Job Training: A Synthesis of the Evidence. <https://www.dol.gov/asp/evaluation/jdt/jdt.pdf>

<sup>20</sup> Crissey, S.R. & Bauman, K. (2010). Between a diploma and a bachelor's degree: The effects of sub-baccalaureate postsecondary educational attainment and field of training on earnings. Paper presented at the Annual Meeting of the Population Association of America, Dallas, TX, April 15-17, 2010. Retrieved from <http://www.edweek.org/media/censusdiplomas-34jobs.pdf>.

education and training community is to embrace the credential system and make it meaningful for industry.<sup>21</sup>

Findings from a case study that examined employers' perceptions of post-secondary credentials demonstrate the importance of effectively engaging employers in order to meet their skill needs. The study found that employers' perspectives on credentials and their expectations for credential holders are shaped by the local labor market and their opinions of the local community colleges.<sup>22</sup> Understanding the expectations employers have of credential holders can help education and training providers to address any employer misperceptions and to customize their programs to meet the needs of both students and employers.

The evidence suggests that when local training providers work in collaboration with industry, they can meet employers' skill needs. A randomized controlled trial study that examined the effectiveness of three sector-focused programs that provide customized training to meet the needs of employers found that the programs had positive impacts on short- and long-term outcomes related to employment, earnings, and the receipt of benefits. The industry sectors in the study included manufacturing, construction, healthcare, and computer repair. The success of these programs was attributed to the close working relationships between employers, education and training providers, and the intermediaries that worked to facilitate the collaboration. These strong working relationships helped develop an understanding of the target occupations and the skills needed for success.<sup>23</sup>

***Building the Evidence Base.*** There is strong evidence demonstrating the value of involving employers in designing and implementing effective training programs. These evaluation findings contribute to understanding how best to promote the benefits of industry-recognized credentials and to persuade employers to prioritize job seekers who have earned them.

### **2.2.3 Career Navigator Services**

Another key component of AzAMI is career navigator services to provide both academic and non-academic supports. AzAMI has one career navigator who recruits new students to AzAMI and provides advisory case management services. The career navigator supports a wide variety of student needs, including help in selecting classes, exploring careers, and developing résumés. In addition, the navigator assists students in understanding and successfully completing critical

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<sup>21</sup> Manufacturing Institute and University of Phoenix (2011). Manufacturing Skills Certification: Employer Perspectives. Phoenix, AZ: University of Phoenix. Retrieved from:

<http://www.themanufacturinginstitute.org/~media/1B429DD80E684BA5AEFAC18DD27C71C7.ashx>

<sup>22</sup> Van Noy, M. & Jacobs, J. (2012). Employer Perceptions of Associate Degrees on Local Labor Markets: A Case Study of Employment of Information Technology Technicians in Detroit and Seattle. CCRC Working Paper No. 39. New York: Columbia University, Teachers College, Community College Research Center.

<https://ccrc.tc.columbia.edu/publications/employer-perceptions-associate-degrees.html>

<sup>23</sup> Maguire, S., Freely, F., Clymer, C., Conway, M., & Schwartz, D. (2010). Tuning In to Local Labor Markets: Findings from the Sectoral Employment Impact Study. Philadelphia: Public/Private Ventures.

college processes, such as financial aid, veterans services, and admissions and records, and also serves as the bridge to connect them with industry opportunities in the form of jobs, training, and internships or apprenticeships.

**Supporting Evidence.** The research highlights the importance of non-academic supports in the community college environment to improve outcomes. A literature review on this topic, funded by the Bill & Melinda Gates Foundation, found that the mechanism by which non-academic supports improve community college student outcomes is “creating social relationships, clarifying aspirations and enhancing commitment, developing college know-how, and making college life feasible.”<sup>24</sup> This study, along with others,<sup>25</sup> argues that community colleges tend to recruit more academically vulnerable students who may struggle more in the academic environment than students in four-year programs. At the same time, the budget-strapped traditional community college system has extremely high student-to-advisor ratios to help address this need.<sup>26</sup>

A few rigorous random assignment studies have shown that intensive community college advising services have a positive impact on students’ short-term outcomes. MDRC conducted a random experiment (the Opening Doors demonstration) that randomly assigned students at two community colleges in Ohio to intensive advising services, including a small stipend for attending advisor sessions. The study found that the treatment group registered for classes at higher rates and earned half a credit more on average than the control group during the treatment period. However, the program impact disappeared once the intensive counseling sessions ended.<sup>27</sup>

Another study randomly assigned 13,000 students in two- and four-year colleges to intensive student coaching services and found positive impacts on college retention rates for the treatment group.<sup>28</sup> The treatment group had higher college retention rates than the control group during the treatment period and also one year later, although the results were not disaggregated between two- and four-year colleges.

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<sup>24</sup> Karp, M. (2011). Toward a New Understanding of Non-Academic Student Support: Four Mechanisms Encouraging Positive Student Outcomes in the Community College. CCRC Working Paper No 28. New York: Columbia University, Teachers College, Community College Research Center, p. 23.

<http://files.eric.ed.gov/fulltext/ED516148.pdf>

<sup>25</sup> Community College Research Center. (2011). Designing a System for Strategic Advising. Why Is Advising Important for Community College Students? New York: Columbia University, Teachers College.

<https://ccrc.tc.columbia.edu/media/k2/attachments/designing-a-system-for-strategic-advising.pdf>

<sup>26</sup> Community College Research Center. (2011). Designing a System for Strategic Advising. Why Is Advising Important for Community College Students? New York, NY: Columbia University, Teachers College.

<https://ccrc.tc.columbia.edu/media/k2/attachments/designing-a-system-for-strategic-advising.pdf>

<sup>27</sup> Scrivener, S. & Weiss, M.J. (2009). More Guidance, Better Results? Three-Year Effects of an Enhanced Student Services Program at Two Community Colleges. New York: MDRC.

[https://www.mdrc.org/sites/default/files/More%20Guidance%20ES\\_1.pdf](https://www.mdrc.org/sites/default/files/More%20Guidance%20ES_1.pdf)

<sup>28</sup> Bettinger, E.P. & Baker, R.. (2011). The Effects of Student Coaching in College: An Evaluation of a Randomized Experiment in Student Mentoring. Working Paper Series No. 16881. Stanford, CA: Stanford University Center for Education Policy Analysis. [https://cepa.stanford.edu/sites/default/files/bettinger\\_baker\\_030711.pdf](https://cepa.stanford.edu/sites/default/files/bettinger_baker_030711.pdf)

In addition, a quasi-experimental study of 107 California community colleges found that advising services improved student outcomes on passing remedial math courses and transferring to four-year postsecondary institutions, particularly for students who faced the greatest barriers.<sup>29</sup>

***Building the Evidence Base.*** The research evidence suggests that intensive advising services can play an important role in helping students navigate the community college environment and achieve improved academic outcomes. The present study further explored the career navigator role within the career pathway framework. Findings from the AzAMI implementation study provide important insights into how career navigators can provide effective advising services.

#### **2.2.4 Summary**

This literature review demonstrates that the major AzAMI program components are based on strong evidence and promising practices identified in the field of workforce development. The findings from the AzAMI program evaluation will help build the evidence base for career pathway initiatives and expand the evidence base related to employer engagement and career navigator roles. In so doing, the evaluation highlights specific practices and approaches for successfully implementing workforce development initiatives that will help inform the development of future programs.

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<sup>29</sup> Bahr, P.R. (2008). Cooling out in the community college: What is the effect of academic advising on students' chances of success? *Research in Higher Education*, 49(8), 704-732.



### 3. STUDY METHODOLOGY

This chapter discusses the qualitative and quantitative components of the evaluation design and methodology. The qualitative component consisted of an implementation study; the quantitative component consisted of analyses of baseline characteristics and services received, and an analyses of outcomes attained. Section 3.1 outlines the research questions that shaped the evaluation design. Sections 3.2 and 3.3 present the methodology for the qualitative and quantitative components of the study, respectively, including data sources, data collection, and analyses.

#### 3.1 Research Questions

The evaluation of the AzAMI program addressed research questions that focus on implementation successes, challenges, and lessons learned, and on participant outcomes. Exhibit 3.1 lists the evaluation’s main research questions related to each evaluation component.

**Exhibit 3.1: Research Questions by Evaluation Component**

Research Question	Evaluation Component	
	Implementation	Outcome
How does the AzAMI program address regional labor market needs?	✓	
How were the various program components designed and implemented?	✓	
What lessons can the field learn from AzAMI program implementation?	✓	
What were the implementation challenges, successes, and lessons learned?	✓	
Who participated in the AzAMI program and how were they recruited?	✓	
What contributions did each of the partners make in implementing the different program components?	✓	
What institutional management practices led to successful implementation and leveraging of other funding sources during and beyond the TAACCCT grant period?	✓	
Did MCC meet its goals in terms of updating existing certification and degree programs, creating new certifications, improving coordination with the workforce system, training students and local industry employees, and developing articulation agreements with other institutions of higher education?	✓	
Was AzAMI effective in promoting assessments and credentials?	✓	✓
Was AzAMI effective in enrolling students in manufacturing education and training?		✓
What were the characteristics of the AzAMI program in terms of student course load, number of semesters with credit hours earned, and number of career navigator visits, by all participants and by student status (program completers, program exiters, and current participants)?		✓
Was AzAMI effective in helping the participants complete the program and earn awards?		✓



Within each of the overarching research questions, the evaluation included many other detailed questions. These were addressed in the site visit interview and focus group discussion guides.

## **3.2 Qualitative Evaluation Methodology**

This section presents the data sources and analysis methodology for the qualitative implementation evaluation.

### **3.2.1 Data Sources and Collection Activities**

To address the research questions associated with the implementation study, the evaluation team collected data during the site visits. Data sources included semi-structured key informant interviews and participant focus groups, as well as regular program check-ins and an extensive review of relevant program documents.

#### **In-Person and Virtual Site Visits**

The first of two in-person site visits conducted as part of the implementation study was completed in October 2014. During this first visit, IMPAQ staff conducted semi-structured interviews with individuals in a variety of roles including the executive director, the career navigator, instructors, college administrators, employer partners, state and local workforce staff, and community partners including:

- Arizona Manufacturing Partnership
- Science Foundation Arizona
- Chandler Gilbert Community College
- Arizona Precision Manufacturing Apprenticeship Program.

The site visit team also toured the AzAMI classrooms and labs. The team focused on gathering initial information on program activities during the early stages of program implementation.

In September 2015, team members conducted a virtual site visit that involved phone interviews with, the same program staff and community partners, to learn about the progress made in program implementation.

The second in-person site visit, conducted in April 2016, focused on the status of implementation toward the end of the grant and the program's accomplishments in terms of capacity and sustainability after the grant funding ends. The visit included interviews with the same program staff and community partners, a focus group with AzAMI students,<sup>30</sup> and attendance at the AzAMI Manufacturing Advisory Forum.

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<sup>30</sup> The AzAMI student focus group was not a representative sample of students; therefore, the focus group findings provide a limited representation of student perspectives.

### **Regular Program Check-ins**

Throughout the evaluation period, the evaluation team conducted regular meetings with the program's executive director and other relevant program staff to ensure that the team was up to date on and aware of all program activities. AzAMI convenes a Core Team meeting monthly that includes faculty, program leadership, staff, and grant partners including IMPAQ to review progress and address needs. These regular check-ins allowed grant staff to inform the evaluation team of any challenges or best practices they identified in program implementation on a real-time basis and offered the evaluation team member an opportunity to ask specific questions about implementation progress.

### **Document Review**

In addition to the program site visits and regular check-ins, the evaluation team conducted a thorough review of program documentation throughout the evaluation period, both during site visits and on a regular basis as documents were developed. Documents relevant to the operations of the AzAMI included the MCC grant application, AzAMI course and career pathway descriptions, student outreach and curriculum planning materials, and partner and advisory team meeting agendas. Information from a review of these documents was incorporated into the findings.

### **3.2.2 Data Analysis**

At the conclusion of the site visits and following the regular check-in meetings, the team analyzed the interview notes and documented the significant themes. This analysis documented program implementation and led to findings that identified program challenges, lessons learned, and best practices. Recommendations for addressing implementation challenges and improving program delivery were developed based on these findings. The findings were also used to help interpret the results of the quantitative analyses.

## **3.3 Quantitative Evaluation Methodology**

This section presents the data sources and analysis methodology used in the quantitative outcomes evaluation. The outcomes analysis is correlational, not causal, and lays important groundwork for further causal research. It provides a comprehensive picture of student demographic characteristics and program characteristics such as course load, credit hours earned, enrollment semester, program of study, number of visits with the career navigator, program completion, and earned industry certificates, certificates of completion, and associate degrees. The outcome study is limited to educational outcomes because individual-level data on quarterly wages and employment could not be obtained from the Arizona Department of Economic Security, Unemployment Insurance Administration.

Notably, this study is an outcomes evaluation rather than the initially planned quasi-experimental evaluation. At the outset of this study, the evaluation team planned to use propensity score matching, a methodology that more rigorously identifies the 'true' impact of the program on the outcomes of interest. However, limitations in the data prevented us from conducting an impact evaluation that provides an estimate of the effect that the program had in increasing educational

and labor market outcomes. The primary limitation was that the comparison group sample available from the college was too dissimilar from the treatment group. Selecting a small group of students from MCC that appeared to have similar demographic characteristics also would not work well for a quasi-experimental study, because the variables available for the baseline demographic characteristics were too limited to consider conducting matching.

*In this study, the treatment group is defined to include all students who participated in the AzAMI program during the grant period of performance. The comparison group consists of MCC students that matched the AzAMI program age and educational levels and who took at least one AzAMI course during the same period.*

### **3.3.1 Data Sources**

The outcomes analysis examined progress made towards the program's educational outcomes during the grant period of performance (Fall 2014 through Spring 2017). Data for the analysis were collected from the following key administrative data sources:

- **MCC Office of Institutional Effectiveness (OIE).** OIE maintains tracking data on credit hours earned, grade point average (GPA), and academic awards achieved at MCC. The data also include the student's initial MCC self-reported application data. The demographic information collected on the admissions application is limited to age, gender, race/ethnicity, citizenship, high school graduation status, and first language. OIE is the sole source of data for MCC students who attended at least one AzAMI course at MCC, but were not participants in the program (the comparison group for this study).
- **AzAMI Office.** The AzAMI office collects data on the progress of AzAMI participants (the treatment group) in a master database. The data include information such as enrollment semester in AzAMI, enrollment in boot camps, total number of visits with the career navigator, and manufacturing industry certificates earned. AzAMI students also complete an application when they enter the program, which collects additional information on demographic and economic characteristics (e.g., educational attainment, veteran status, employment status, hourly wage, eligibility for Trade Adjustment Assistance) compared to the MCC application.
- **AzAMI Application Data.** The AzAMI self-reported application data provide some demographic information on AzAMI participants that are not available in OIE records, including highest educational attainment, eligibility for Trade Adjustment Assistance (TAA), veteran status, employment status at enrollment, enrollment of students from manufacturing employer partners, baseline wages at enrollment and recruitment source. TAA eligibility is verified by AzAMI program staff.

Exhibit 3.2 lists all the variables used in the descriptive and outcome analyses.

**Exhibit 3.2: Data Elements Available for the Treatment and Comparison Groups**

Element	Treatment Group (AzAMI Participants)	Comparison Group
<b>Student Characteristics at Baseline (Student Application)</b>	<ul style="list-style-type: none"> <li>▪ Age</li> <li>▪ Gender</li> <li>▪ Race</li> <li>▪ High school completion status</li> <li>▪ Citizenship</li> <li>▪ First language</li> <li>▪ Pell recipient</li> <li>▪ Continuing/former/or new student at MCC</li> <li>▪ Educational attainment</li> <li>▪ Veteran status</li> <li>▪ Limited speaking, writing, or reading abilities</li> <li>▪ Employment status</li> <li>▪ Hourly wage</li> <li>▪ Hours worked per week</li> <li>▪ Applied for financial aid</li> <li>▪ Walmart or Bowing Scholarship recipients</li> <li>▪ Eligibility for Trade Adjustment Assistance</li> </ul>	<ul style="list-style-type: none"> <li>▪ Age</li> <li>▪ Gender</li> <li>▪ Race</li> <li>▪ High school completion status</li> <li>▪ Citizenship</li> <li>▪ First language</li> <li>▪ Pell recipient</li> <li>▪ Continuing/former/or new student at MCC</li> </ul>
<b>Program-Specific Characteristics</b>	<ul style="list-style-type: none"> <li>▪ Course load in last semester (full-time, part-time, less than part-time)</li> <li>▪ Credit hours earned in AzAMI courses per semester</li> <li>▪ Credit hours earned in other MCC courses per semester</li> <li>▪ GPA</li> <li>▪ Semesters enrolled</li> <li>▪ Program of study</li> <li>▪ Number of advisor visits with the career navigator</li> </ul>	<ul style="list-style-type: none"> <li>▪ Course load in last semester (full-time, part-time, less than part-time)</li> <li>▪ Credit hours earned in AzAMI courses per semester</li> <li>▪ Credit hours earned in other MCC courses per semester</li> <li>▪ GPA</li> <li>▪ Semesters enrolled</li> </ul>
<b>Outcomes</b>	<ul style="list-style-type: none"> <li>▪ Earned a certificate of completion (CCL)</li> <li>▪ Earned an associate in applied science (AAS) degree</li> <li>▪ Earned any award, including a CCL, AAS, or industry certificate</li> </ul>	<ul style="list-style-type: none"> <li>▪ Earned a certificate of completion (CCL)</li> <li>▪ Earned an associate degree</li> <li>▪ Earned any award, including a CCL, AAS, or industry certificate</li> </ul>

### 3.3.2 Data Analysis Methodology

The quantitative analysis consisted of a descriptive analysis and a multivariate regression analysis, as is summarized below.

#### Descriptive Analysis

Using baseline data from the MCC and AzAMI admission applications, administrative data from the college and the program, and outcomes data on program completion and certificates or degrees earned, the evaluation team developed descriptive analyses of individuals' characteristics, outcomes, and program participation.

**Analysis of program participation.** We used the program administrative data to analyze program participation among the treatment group. We observed student status (participant, completer, exiter) by the grant year enrolled, the course load in the last semester enrolled, and the number of career navigator visits. In addition, we also looked at the number of advisor visits by program type and grant year enrolled. Completers, exiters, and current participants are defined below:

- *Completers.* Students who earned an AzAMI credential (industry certificate, certificates of completion and an associate in applied science degree).<sup>31</sup>
- *Exiters.* Students who did not earn an AzAMI credential and missed more than one sequential semester taking AzAMI courses.
- *Current participants.* Students who have not yet earned an AzAMI credential and have not missed more than one sequential AzAMI semester taking AzAMI courses.

**Analysis of outcomes.** Using program administrative data, we also analyzed credit hours earned at AzAMI and MCC, average number of semesters by student status (participant, completer, exiter), enrollment persistence (continuous enrollment, meaning no skipped semester; intermittent enrollment or skipped terms; attended the program for one semester only) as well as the grant year enrolled. Other outcomes included obtaining an industry certificate, certificate of completion (CCL), and associate in applied science degree.

### **Multivariate Analysis**

In addition to the descriptive analysis, we conducted a multivariate regression analysis to assess the association between student demographics and program completion outcomes. We used a linear probability model to measure this association between the treatment and comparison groups. The model can be expressed by the following equation:

$$Y = \alpha \cdot T + X \cdot \beta + \epsilon$$

The dependent variable,  $Y$ , is the participant outcome of interest. Control variables include  $T$  (equals 1 if the individual was in the treatment group, 0 if the individual is in the comparison group);  $X$  (includes all available individual baseline demographic characteristics and a constant term); and  $\epsilon$  (a zero-mean error term).

This model was estimated separately for each outcome of interest. The parameter of interest,  $\alpha$ , is the regression-adjusted treatment effect of the AzAMI program on the outcome of interest. Note that controlling for  $X$  not only increases the statistical power of the estimated parameter, but also ensures that the estimated parameter is not tainted by any differences in characteristics between the treatment and comparison groups.

The key limitation of this approach is that we can only control for the baseline demographic differences between the participant and comparison groups that are observable in the data and

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<sup>31</sup> Students could be completers and still pursuing other awards at MCC. In such cases, we count all such individuals only once, as a completer.

available for both groups. Notably, some important baseline socioeconomic variables, such as employment characteristics, wage information, and highest educational attainment, were available only for the participant group.

## 4. IMPLEMENTATION STUDY FINDINGS

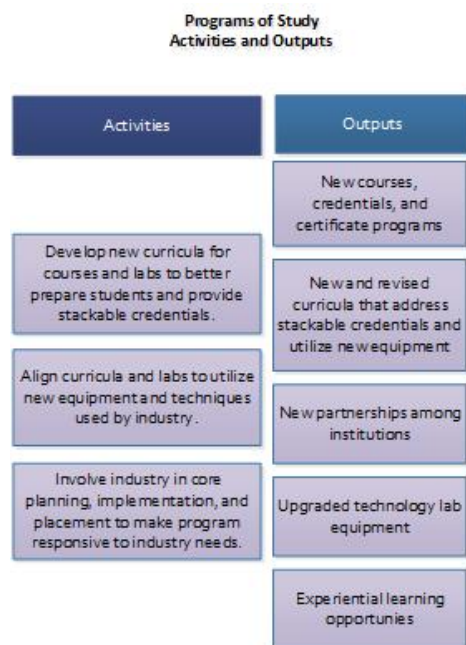
This chapter presents the findings of the implementation study of the AzAMI program. The findings are organized into the following sections: (1) AzAMI program components, (2) outreach and recruitment, (3) program enrollment and participation, (4) program initiatives, and (5) program management and sustainability. Each section highlights progress made toward implementing program activities and achieving the outputs and outcomes in the program logic model that were measurable by the evaluation team. Progress toward achieving additional outputs and outcomes is presented in Chapters 5 and 6.

### 4.1 AzAMI Program Components

AzAMI offers training and academic courses, credentials, and degrees that align with five programs of study and make up a series of career pathways. Each program of study is enhanced with hands-on learning opportunities. In addition to the core programs of study, AzAMI offers boot camps and career navigator services, both of which were new initiatives for MCC.

#### 4.1.1 Programs of Study

AzAMI’s educational offerings center on five core programs of study: electronics, drafting, automation, machining, and welding. Though all five programs existed before the TAACCCT grant program, the curricula have been improved to incorporate employer feedback, teach to new equipment purchased with grant funds, and meet the standards for industry-recognized credentials. For example, the drafting program has recently been expanded to offer a course in additive manufacturing, which is often referred to as 3D printing. This course teaches the background, terminology, fundamentals, and design principles of additive manufacturing. Students learn and apply techniques through lab activities, machine operation and maintenance, part design and analysis, adaptation of stereolithography files, printing of models, and post-processing. The course uses newly purchased desktop 3D printers that align with those currently used in the industry.



#### Employer Feedback

AzAMI faculty and staff engage employers through the AzAMI advisory team and program advisory committees to gather feedback on overall program development and implementation. The program advisory committees also serve to elicit feedback from employers on curricular revisions and equipment purchases. Instructors and employers agree that these efforts have been successful in developing programs that better meet the needs of employers.

## New Equipment

Both early in the grant period and towards the end, MCC made significant investments in new training equipment for the AzAMI educational programs. Program staff reported that curricula had to be modified to teach students how to use the new equipment. Although most of the equipment was acquired for existing courses and programs of study, a robotic welding arm was purchased with the intent of creating a new program to meet expected employer demand.<sup>32</sup> After the purchase, it was determined that there was not enough employer demand to justify a robotic welding program. As one program staff member commented, “[When] we got the grant, we didn’t have enough time to pull all that [industry consultation] together to tell us that.” Rather than create the planned program and invest time in certifying instructors in robotics, AzAMI staff developed an alternative, more cost-efficient plan for using the robotic welding arm. They worked with the company that built the robotic welding arm to incorporate modules on using the new equipment into existing welding and automation courses.

“Sometimes you have to have industry speak to [equipment purchases].... [When] we got the grant, we didn’t have enough time to pull all that industry together to tell us that.”

– Program staff member

Despite these new equipment purchases, students reported concerns with the quality of the equipment they used in their classes. They complained that some classroom equipment was old, unmaintained, or even broken. Some students also noted that they have not had the opportunity to use the new equipment.

## Industry-Recognized Credentials



“Pursuit of the NIMS certification resulted in a highly collaborative process that inspired continuous improvement in our advanced manufacturing programs benefiting our students, staff and ultimately our industry partnerships.”

Source: NIMS

Faculty stated that they thought the new offerings of stackable and industry-recognized credentials have been one of the most important initiatives of the program. These offerings give students the opportunity to earn credentials as they move through the program and to build on those credentials to pursue more advanced credentials and degrees. The stackable and industry-recognized credentials available through the AzAMI program are presented in Appendix A.

Among the most notable new industry-recognized credential offerings are the National Institute for Metalworking Skills (NIMS) certifications. The AzAMI program received NIMS accreditation in December 2015. This accreditation, based on national industry-written and industry-driven skills standards, is the highest benchmark for metalworking training in the United States. The accreditation is based on NIMS National Skills Standards for Machining Level I and II, with a focus on the manual and computer numerically controlled (CNC) machining skills that allow AzAMI students to pursue all credentials offered by NIMS.

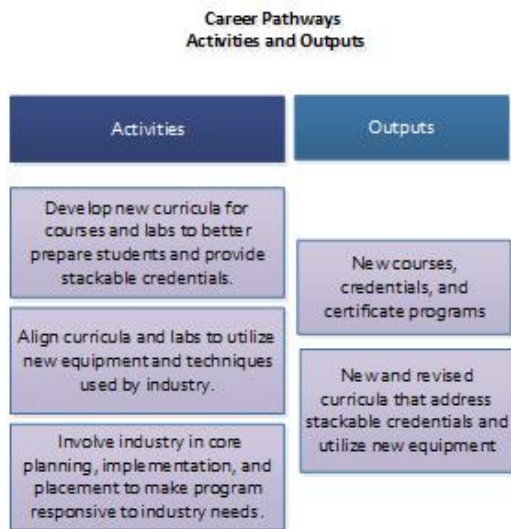
<sup>32</sup> See MCC grant application.



Following the completion of the NIMS accreditation process, the accreditation team reported that it was highly impressed with the AzAMI program; it issued the program *above average* ratings in six evaluation areas.

At the end of the grant period, 48 NIMS certifications had been earned by AzAMI students. Additionally, there were 5 current CNC courses preparing approximately 30 students for the NIMS certification process.

### 4.1.2 Career Pathways



The AzAMI programs of study, courses, credentials, and degrees make up a series of career pathways. Understanding these career pathways—how specific courses lead to credentials, degrees, and careers—is essential to student success. Clearly defined career pathways help inform the short-term and long-term decisions students make about their education, training, and careers.

AzAMI program staff have worked to “clean up” and clarify AzAMI career pathways, helping students to better navigate those pathways by making informed choices about the courses they take and the careers they pursue. In addition, AzAMI supports students in

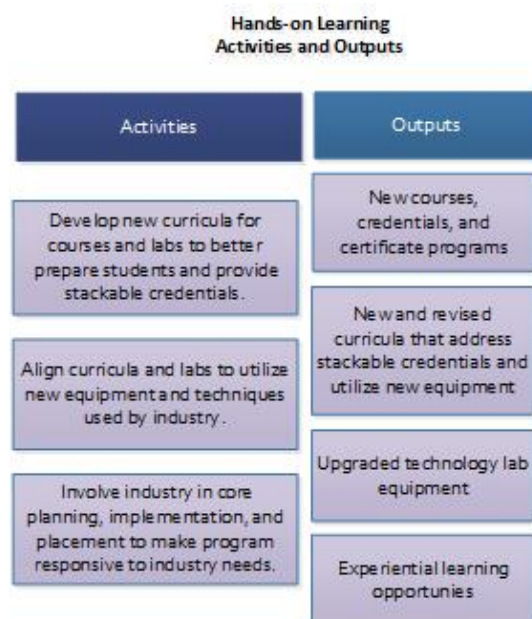
navigating career pathways by offering guidance from the career navigator and a career pathways software product. Leveraging funding from another grant, the AzAMI program piloted the career pathways software program Viridis, which allows students to select courses that align with their desired career pathway. The college has since pursued the Guided Pathways Project institutionally and will be using an alternative software product moving forward.

### 4.1.3 Hands-on Learning Opportunities

The AzAMI program offers students many different hands-on learning opportunities, including student laboratories, apprenticeships, and internships.

#### Student Laboratories

All students enrolled in AzAMI programs have access to labs outside of normal class hours to work on projects under faculty supervision. New equipment purchased using grant funds and valued at over \$500,000 has improved the lab offerings, giving students the opportunity to learn current industry techniques. Major equipment purchases include a new welding system, a CNC 5-axis machining center,



a CNC Y-axis lathe mill/turning center, and a Fanuc robotic system.<sup>33</sup> Equipment purchases also include all the corresponding tools, parts, and software required to use the equipment correctly.

### **Apprenticeships**

AzAMI faculty, staff, and partners have also worked to increase the apprenticeship opportunities available to AzAMI students. A major achievement under the grant, and for MCC in general, was to become a member of the Registered Apprenticeship College Consortium (RACC). Membership allows students to fully transfer their credit hours to other colleges within the consortium. AzAMI faculty and staff worked with program partners including the Department of Economic Security State Apprenticeship Office, to apply for RACC membership, which was approved in 2015.

AzAMI had 12 apprenticeship slots for students and was able to place nine students with three employers: Empire Machinery, Modern Industry, and ARCAS Machine. Faculty, staff, and partners noted that they experienced challenges in working with employers to create more apprenticeship opportunities for students. Multiple respondents, including program staff and workforce development representatives, commented that the major barrier in making progress in this area is that employers are reluctant to offer apprenticeships because they associate apprenticeships with unions. Respondents also noted that employers have the misperception that offering apprenticeships will cost them a lot of time and money.

Students' concerns about apprenticeships may also account for the program's inability to fill all the available slots. One AzAMI staff member stated that students have limited interest in participating in apprenticeships. Students reported that they were aware of only a limited number of apprenticeship opportunities, but they appeared to have little interest in taking advantage of those opportunities. Students expressed concerns about the challenges of working in an apprenticeship for what they described as low wages while trying to finish their academic program at the same time. AzAMI faculty, staff, and partners are working to address these employer and student concerns about apprenticeships in order to create more opportunities and generate greater student interest.

### **Internships**

The AzAMI team has made significant progress in working with employers to create internship opportunities, placing a total of 18 students in internships. TRW, Sound Packaging, Van Horne Aviation, Rural Electric, and First Impressions all brought AzAMI students on for paid internships. Some of these students have since been hired into full-time positions. TRW was so impressed with the quality of workers coming out of the AzAMI program that it held on-site events to recruit interns. Although some employers are very enthusiastic about internships, a workforce partner noted that many employers are hesitant to offer paid internships.

Program staff reported that they had to be selective about the industries in which they developed internship opportunities. They explained that employers in high demand fields that are desperate to fill lower-level positions, for example, in mechanics and welding, tend to use internships as a

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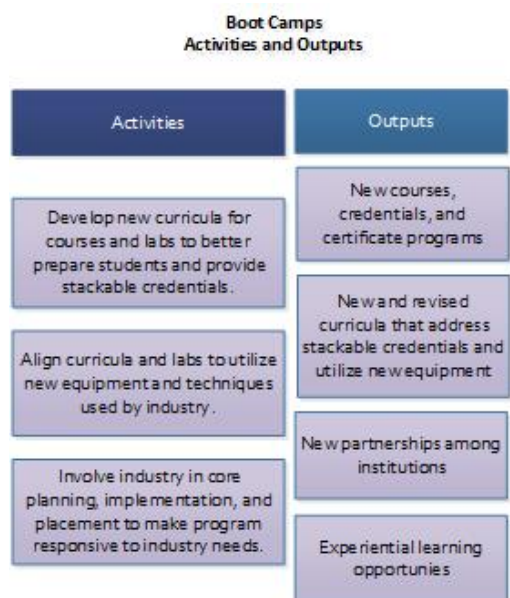
<sup>33</sup> AzAMI Equipment Inventory List.

source of low-cost labor, without offering meaningful student experiences or the possibility of full-time employment. A program staff member noted that internships in the lower-demand trades, where there is not a constant demand for lower-level positions, were more successful in creating a pipeline to full-time employment because these employers are more committed to grooming students to become employees.

#### 4.1.4 Boot Camps

Organized separately from the AzAMI programs of study, boot camps are two-week competency-based certificate programs offered in collaboration with employers and training providers. Boot camps cover both employability skills and technical content. Participants demonstrate their skills and prior experience in order to earn industry-recognized credentials, including the National Career Readiness Certificate. On completion, participants receive a certificate documenting the AzAMI competencies they have acquired.

At the beginning of the project, participants could earn general college credit through the boot camp but could not earn credit toward their AzAMI program of study. Boot camp participants felt that they should be able to earn credit toward their program. AzAMI staff addressed this problem by adding the boot camp courses to the course bank approved by the curriculum committee. The boot camp courses are now included in the associated program of study and serve as prior learning credits for their associated courses.



Participants in the Boeing Electrical Wiring boot camp explained that the content reflected what is done in the workplace. Some reported that they would like to see boot camps that offer instruction in more advanced “class 3 environment” skill areas (referring to the risk associated with the product), because the existing boot camps provide only a general overview of all the classes.

Boot camps are an ideal training opportunity for incumbent workers or job seekers who have prior skills and experience and are looking to become highly skilled and certified in their field. Exhibit 4.1 illustrates the process participants must follow to apply for and complete the boot camps and earn the associated certifications. Applicants must complete an online self-evaluation to demonstrate their prior knowledge and experience before they enroll in the boot camp; applicants who score 80 percent or above on the evaluation are allowed to register. Prior to the start of the boot camp, participants take a pre-test to gauge their technical skills. During the boot camp, participants work to demonstrate and refine industry-desired skills. A final skills evaluation is then administered to determine whether participants have earned the boot camp certificate.

Applicants who score lower than 80 percent on the self-evaluation are not permitted to participate in the boot camp but can enroll in the AzAMI 16-week program course that covers the same content, results in the same certification, and awards credit toward a degree.

**Exhibit 4.1: Boot Camp Certification Process**



AzAMI program faculty and staff worked with employers, including Boeing, Northstar, and Van Horn Aviation, to develop curricula for four boot camp programs: Electrical Wiring J-Standard, Composite, Mechanical/Precision Assembly, and Sheet Metal. Boot camp courses were offered in Summer 2016 and Spring 2017. Exhibit 4.2 indicates the status of each boot camp program.

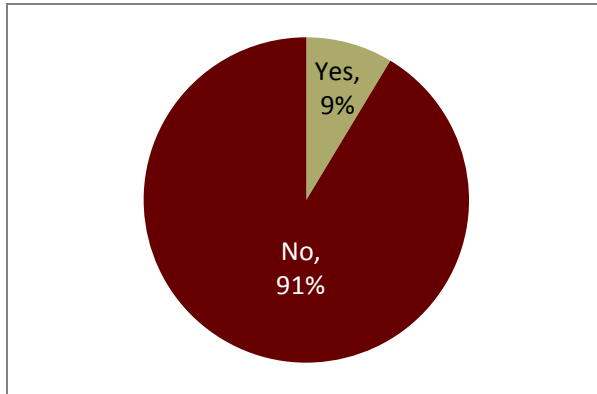
**Exhibit 4.2: Boot Camp Status**

Status	Electrical Wiring	Composite	Mechanical/Precision Assembly	Sheet Metal	Additive Manufacturing
Curriculum Developed	Yes	Yes	Yes	Yes	Yes, but with state-leveraged funding
Beta-Tested	Yes	Yes	Yes	No	Yes
Implemented	4 courses held	Offered but not held	No	No	Yes

As Exhibit 4.2 shows, three of the boot camp programs were beta-tested with employers. The four classes of the Electrical Wiring boot camp were implemented using a hybrid format, in which the employability section of the curriculum was delivered online and the in-class sessions covered the application of skills and assessments. All participants completed the course successfully, and 11 were hired by Boeing. The Composite boot camp was offered in three different semesters but did not enroll a sufficient number of participants to be held. AzAMI plans to offer the Composite boot camp in a hybrid format (in-person and online) to offer more flexibility to potential participants who are already employed. Exhibits 4.3 and 4.4 present the boot camp participation rate overall and by program of study, respectively. Exhibit 4.3 shows that the participation rate was 9 percent of all AzAMI participants. Exhibit 4.4 shows that about one-third of students in the

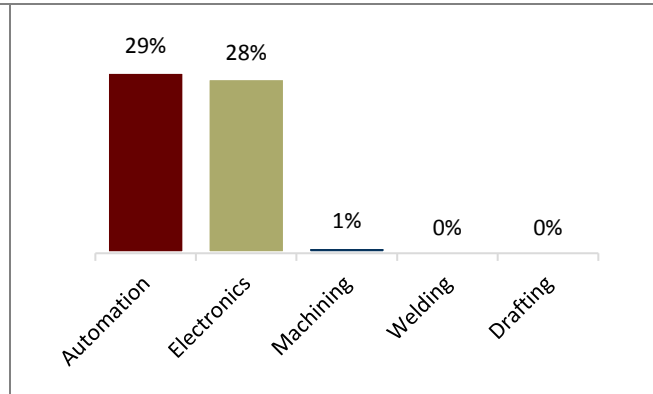
Automation and Electronic programs were boot camp participants. All students who enrolled in boot camp also “passed” boot camp and earned the J-Standard industry certificate. Pre-participants were not allowed to participate in boot camps.

**Exhibit 4.3: Boot Camp Participation**



N=463

**Exhibit 4.4: Boot Camp Participation, by Program of Study**



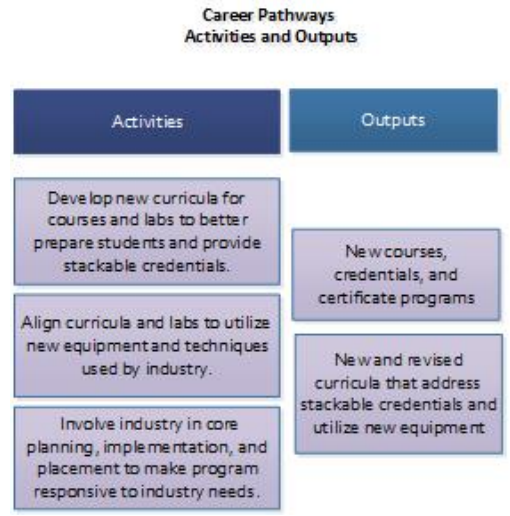
AzAMI faculty and staff noted that the collaboration with employers on curricula development, was key to the success of the boot camps. Another important partner in developing and implementing the boot camps was Chandler Gilbert Community College (CGCC). Faculty from MCC and CGCC collaborated on curriculum development for all four boot camps and worked together to instruct the courses, ensuring that faculty did not go over their allotted course loads. The strong working relationship between MCC and CGCC has enabled them to share equipment, which also helped to make the boot camps a success.

“This grant helped facilitate collaboration between schools, which always requires extra resources.”  
 — Chandler Gilbert Community College representative



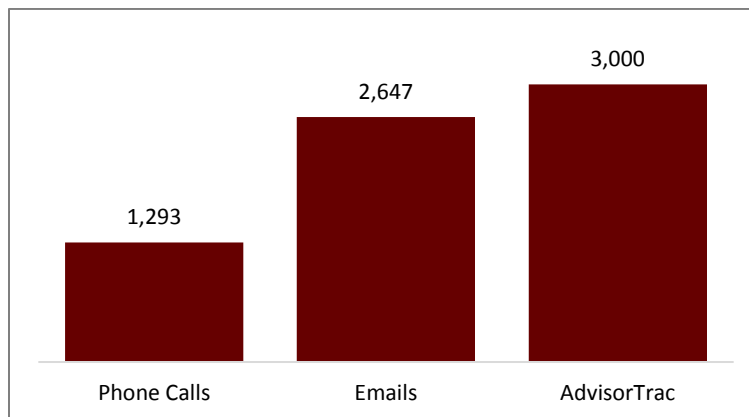
### 4.1.5 Career Navigator Services

The work of the career navigator is clearly one of the major successes of the AzAMI program. As outlined by MCC in its TAACCCT grant application, the main objective of the career navigator is to support students from the time of their initial registration through to job placement. The feedback received from program staff, faculty, and students indicates that the current career navigator meets this major objective and does much more. The primary responsibilities of the position as it was implemented under this grant include academic advising, outreach and recruitment, student events, and nonacademic support services. In addition to the services offered directly, the career navigator also linked students with academic and nonacademic services offered by MCC, including tutoring, testing, career services, counseling, and financial aid as well as services offered through the college’s Technical Help Center, Library, Disability Resource Center, Veterans Center, and Community Engagement Office. Exhibit 4.5 shows the number of contacts the career navigator had with students by phone, by email, and through AdvisorTrac (the online advisor management system) during the grant period.



Two important aspects of the career navigator services are access and consistency. The career navigator works to ensure that AzAMI students are aware of the services and opportunities available to them and that all student requests are addressed. It is important to note that, with a lower caseload and a specific group of students to target, the career navigator is able to form strong, lasting relationships with students. This is a different role from that of an academic advisor in that the career navigator can work collaboratively with students to help them meet their goals.

**Exhibit 4.5: Number of Career Navigator Student Contacts**



Note: Information provided by AzAMI

## Academic Advising

The career navigator is an academic advocate for the students he serves. As needed, the career navigator assists students with class registration, course selection and program planning, internship opportunities, and graduation preparation. He helps students with both substantive activities, such as selecting the appropriate courses for a specific degree, and with administrative tasks, such as completing the necessary paperwork to override a prerequisite for a course.

Prior to AzAMI, “there was no academic advisor for this department,” said one student. The student went on to say that the career navigator had “taken on a dual role as career counselor and academic advisor, which was something that this department has desperately needed. He has done an excellent job.”

The career navigator piloted the use of the Viridis software, which allows students to select courses that align with their desired career pathway. This work involved customizing the software to the programs of study and career pathways offered under AzAMI. Another new tool that has helped the career navigator in working with students is Skillful. Skillful offers users the opportunity to explore career options, identify skill requirements for specific jobs and training options, and search for employment

opportunities. Although Skillful offers many useful resources for job seekers and employers, it may be better suited for small to medium-sized employers. One large employer noted that, because the company already has in-house many of the resources available through Skillful, it may not adopt the tool. For this reason, the college has now adopted a platform called NACE Link, which has the same outcomes and objectives, and is in the process of deploying it for the entire student population. Moreover, the college has also implemented a Guided Pathways approach that was motivated by the example of the manufacturing program, where students are able to attain a clear map of their path right from the outset.

## Student Outreach and Recruitment

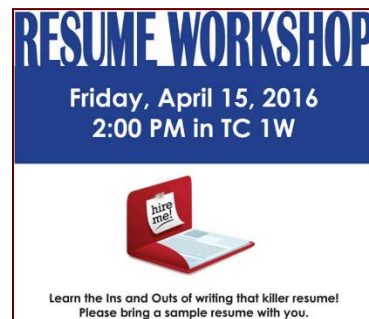
The career navigator conducts outreach to AzAMI students to inform them about the availability of career navigator services. He gives presentations about AzAMI in over 45 classes each semester, providing students with an understanding of the career navigator services and how they help students successfully progress through their planned program of study. Appendix B presents a career navigator flyer used for student outreach.

## Student Events

The career navigator also holds events to help students prepare for their careers. These events include student field trips to shadow workers at employer sites, résumé workshops, and job interview preparation sessions.

## Nonacademic Support Services

In addition to academic advising services, the career navigator provides students with a wide range of support services, including identifying sources for and obtaining financial aid, working with veterans to access their benefits, helping students address childcare issues, and providing job search assistance. Both faculty and students have spoken highly of the value and importance



of the services provided by the career navigator. Students described the career navigator as very proactive and said that they began taking advantage of his services only after he reached out to them. The positive feedback on the current career navigator points not only to the value of the position but also to the importance of filling the position with an outgoing, hard-working, and committed staff member whose passion lies in helping others succeed.

The career navigator “is great,” said one student. “He calls me and emails me to ask me if I am doing OK in my classes. I don’t have enough good things to say about him. He is doing a great job to make the program known among students and to extend the resources to them. And I know that a lot of students are taking advantage of them.”

## 4.2 Outreach and Recruitment

AzAMI program staff and partners have worked extensively to conduct program outreach and recruit program participants.

### 4.2.1 General Outreach

General outreach activities are aimed at increasing awareness of the AzAMI program and of manufacturing jobs in general, among employers, existing and potential program partners, current and potential students, and job seekers.

Standard marketing materials, such as flyers, brochures, and the program website, were cited as essential tools for conducting outreach and recruiting potential AzAMI students (see Appendix C for an example of AzAMI promotional flyers). The AzAMI website contains a high-level description of the program together with information on the services, types of training, and programs offered. The site includes lists of the associate degrees and certificates offered under the AzAMI program. For each degree and certificate, the course sequence list is provided. The site also contains links to other pages on the MCC website that provide information on career pathways and career and technical education.



Using social media, staff worked to create awareness of the program, move traffic to the program website, and interact directly through different social media platforms. These efforts have led to over 2,300 page views on the program website, 125 Facebook and 102 Twitter followers, and over 2,600 tweet impressions.

AzAMI has also worked to develop a robust social media campaign to engage industry partners, community leaders, the general public, and current and prospective students. Using both Facebook and Twitter, AzAMI staff regularly posted content aimed at increasing awareness of the program and engaging relevant audiences. “Manufacturing Mondays”



is one example of an AzAMI social media campaign. Every Monday, program staff post content that is either relevant to the manufacturing industry in general or specific to the AzAMI program. Program staff also regularly post content on Thursdays and Fridays.

“Public perception is that manufacturing is gone, right? And that’s not the case. You see we have a need, and you see other employers have a hard time finding people. The challenge is getting perceptions changed. You can have a robust career.... Some of these manufacturing positions pay very well. I don’t think people know what the potential is.”

— Employer

AzAMI program staff have spearheaded and supported many general outreach events with the goals of addressing misperceptions about manufacturing jobs and spreading the word about the quality of AzAMI programs. AzAMI staff themselves have hosted 136 events, including program open houses, K-12 student recruitment events, workshops, and forums. For



example, AzAMI staff hosted open houses as part of the Annual Manufacturing Day events planned and coordinated by three major industry associations and partnerships. These open houses allowed visitors, including both prospective students and industry representatives, to tour the manufacturing labs and explore the AzAMI program offerings.



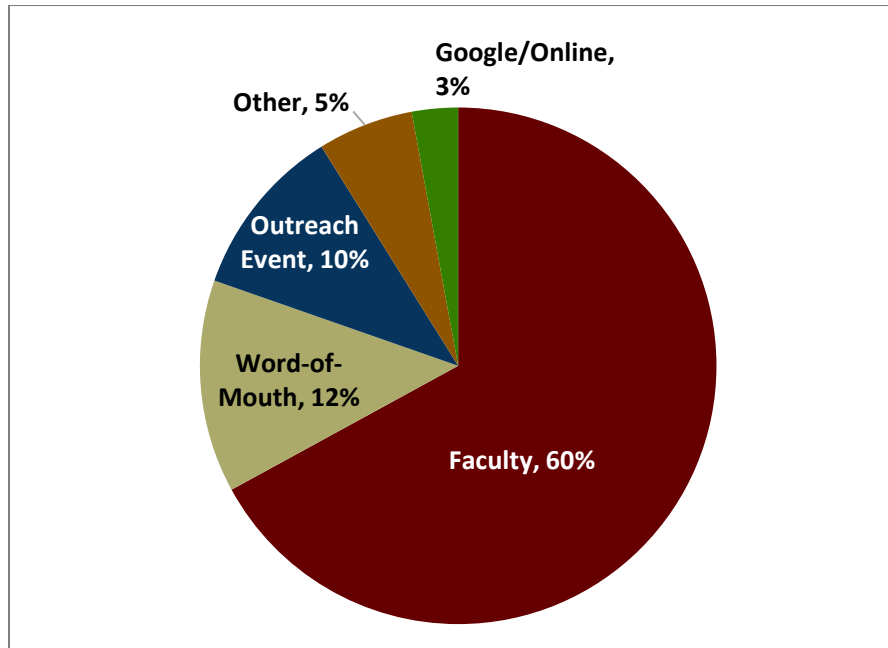
The AzAMI program is also part of “Dream It. Do It.”—a national platform that promotes manufacturing as a top-tier career choice. Dream It. Do It. consists of a network of industry leaders who develop pro-manufacturing activities, which are then customized to local, state, and regional needs. Through this initiative, AzAMI has learned best practices for addressing misperceptions about manufacturing and has leveraged the initiative’s tools, materials, events, and activities to enhance outreach efforts.

AzAMI has also hosted 27 other general outreach efforts and activities, including job fairs and employer on-site recruitment efforts (See Appendix D).

#### 4.2.2 Participant Recruitment

The AzAMI executive director and the career navigator have primary responsibility for participant recruitment activities. In addition to general program outreach, program staff have implemented targeted recruitment efforts to bring current MCC students, TAA-eligible workers, and unemployed individuals, and veterans into the program. Exhibit 4.6 presents the reported sources of recruitment across these populations.

**Exhibit 4.6: Recruitment Source of Program Participants**



Note: "Other" includes advisor, class, email, J-Standard Boot Camp, and Job Fair.  
N=463

### Currently Enrolled Students

Although AzAMI program recruitment efforts include creating awareness about the boot camps, program staff reported that the best recruitment tool for the boot camps has been staffing agencies hired by local employers. These agencies have sent job applicants to the boot camps to get the skills they need to get hired.

As described above, the career navigator is responsible for giving presentations to AzAMI students that describe the program and the benefits of enrollment, address students' questions, and encourage students to take advantage of career navigator services.

The full-service information desk on-site at AzAMI was also cited by program staff as a useful recruitment tool. The information desk enables

students to quickly ask questions and request program information without scheduling a formal meeting with the career navigator.

### TAA-Eligible Workers and Unemployed Individuals

AzAMI program staff collaborated with the state TAA coordinator and Workforce Innovation and Opportunity Act (WIOA) staff in the Arizona Department of Economic Security to develop a recruitment strategy for TAA-eligible workers and unemployed individuals. This strategy included American Job Center staff briefings, workforce agency/organization website promotion, and marketing tools to encourage TAA-eligible workers and unemployed individuals to participate in AzAMI.

In addition to these efforts, AzAMI program staff have successfully engaged both workforce and employer partners through East Valley employer outreach meetings. Program staff explained that workforce partners, including case workers, attend these meetings and gather information about the AzAMI program to take back to the job seekers they serve.

To date, however, the program has not been successful in recruiting significant numbers of TAA-eligible workers and unemployed individuals. Program staff and workforce development representatives report that there is a limited pool of TAA-eligible workers in the area from which to recruit. Another challenge is that many TAA-eligible individuals have already been laid off multiple times and have “bounced around” among manufacturing companies that closed in succession. As a result, some TAA-eligible job seekers are hesitant to pursue or continue a career in manufacturing for fear of being laid off again in the future.

### **Veterans**

The AzAMI program has had more success in recruiting veterans. The career navigator has worked directly with veterans’ services offices at MCC and elsewhere to inform staff about the program and encourage them to make referrals to the program when appropriate. AzAMI has also partnered with the Veterans Family Coalition to increase awareness of the program among spouses of veterans.

## **4.3 Program Enrollment and Participation**

Students can learn about AzAMI before they enroll, while they are enrolled in AzAMI courses , or by presentations given by the navigator in non-AzAMI classes. Once students commit to being a part of AzAMI, they are continually supported and tracked by AzAMI staff. This section presents the different levels of program enrollment and provides an overview of program participation. It is important to note, however, that students come to AzAMI with a variety of goals. Some can be accomplished quickly, but others require multiple semesters or years. AzAMI is based on the idea of stackable credentials so that students remain motivated to attain their goal and the needs of all students can be met.

### **4.3.1 Levels of Program Enrollment**

Students can be enrolled in an AzAMI course or program of study at one of three enrollment levels: general enrollment, pre-participant, and participant.

#### **General Enrollment**

General enrollment students have enrolled in an AzAMI course or program of study but usually are not eligible for career navigator services and are therefore not considered “participants” for the purposes of the evaluation. Although these students are technically not eligible to receive career navigator services, they were not denied assistance if they requested it.

### **Pre-Participant**

Students who are enrolled in AzAMI courses become pre-participants when they complete and sign the participant consent form. Once they become pre-participants, they are eligible to receive all career navigator services.

### **Participant**

Pre-participants and participants are eligible to receive the same services. The only difference is that participants are included in the reporting to the U.S. Department of Labor. The executive director and the career navigator use a rubric to determine whether pre-participants become full program participants (see Appendix E). The rubric lists the criteria used for making this determination and offers guidelines for reviewing each pre-participant's plan of study, transcripts, assessment scores, status as TAA-eligible or as a veteran or spouse of a veteran, and employment status. Veterans, spouses of veterans, and TAA-eligible pre-participants automatically become full program participants.

The following criteria are used for determining whether to move a student from pre-participant status to participant status:

1. *Enrollment*: Student must be admitted to MCC and must complete the AzAMI intake form.
2. *Persistence and retention*: Student must be making academic progress toward a program of study.
3. *Successful course completion*: Student must have successfully completed at least 75 percent of the credits in which he or she was enrolled in the *previous* semester.
4. *Declared program*: Student must have identified training goals.
5. *Match to program goals*: Student's interest in pursuing an industry-recognized credential, as stated in the intake form, is assessed.

Students must meet criteria 1–4 to be moved to participant status. Criterion 5 is encouraged but not required.

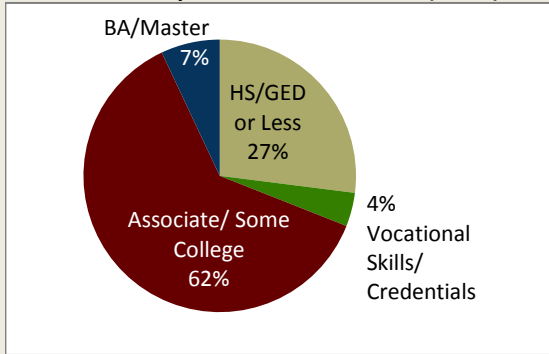
The executive director and the career navigator moved pre-participants to participant status if their plan of study and transcripts demonstrated that they were likely to earn a certificate or degree within the grant period. Students enrolled in AzAMI courses who took one class per semester over the last two years, for example, were likely not to be moved to participant status because they were not expected to earn a certificate or degree within the grant period.

Exhibit 4.7 shows the education, employment, and veteran status of both pre-participants and participants at the time of program application.

### Exhibit 4.7: Pre-Participant and Participant Characteristics

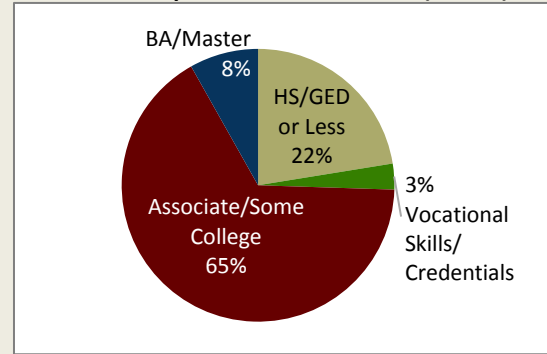
This exhibit presents the education, employment and veteran status of both pre-participants and participants. Pre-participants and participants had very similar levels of education. Slightly more participants have an Associate degree/some college and a BA/Master’s degree.

**Pre-Participant Education Status (N=85)**



N=85

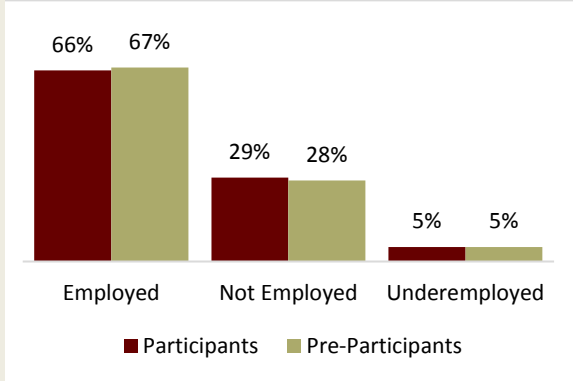
**Participant Education Status (N=463)**



N=463

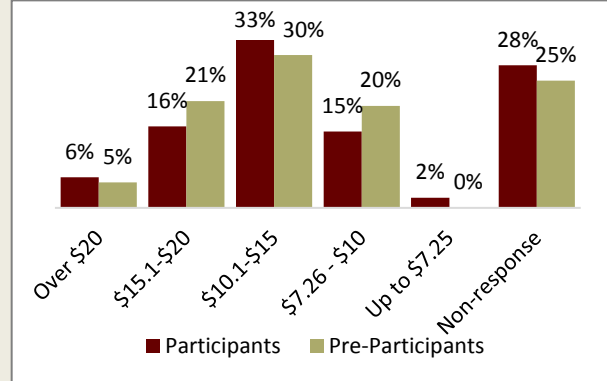
Pre-participants and participants were also very similar when in employment status. The majority of both groups were employed: nearly 30 percent of students in both groups were unemployed. Employed participants were slightly more likely than employed pre-participants to make between \$10 and \$15 per hour (33 percent vs. 30 percent, respectively) while pre-participants were more likely than participants to make over \$15 per hour (26 percent vs. 22 percent, respectively).

**Employment Status**



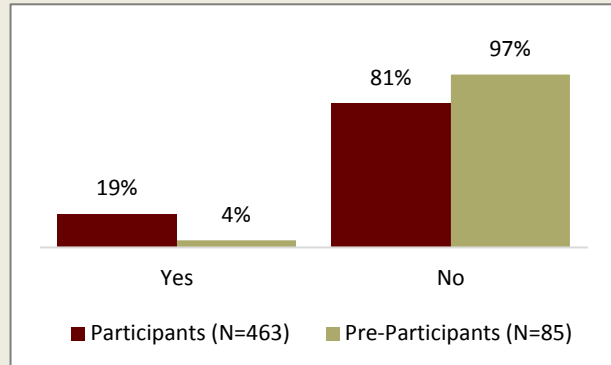
**Hourly Wages of Employed**

(Non-response did not provide wages)



While participating veterans were more likely to be participants than pre-participants (19 percent vs. 4 percent, respectively), among both groups, the vast majority were not veterans (81 percent and 97 percent, respectively) groups. While veterans automatically become full program participants, 4 percent of veterans that completed an application never enrolled in courses. Therefore they remained pre-participants.

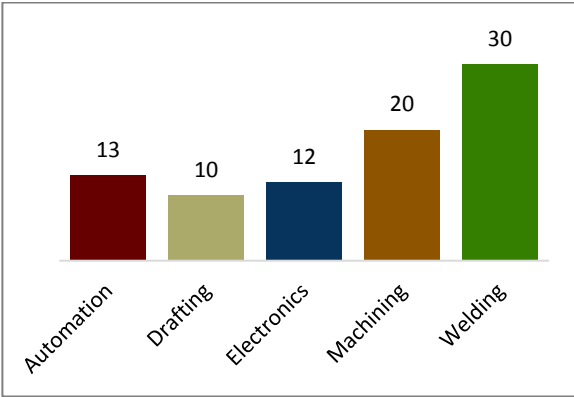
**Veteran Status**



### 4.3.2 Program Participation

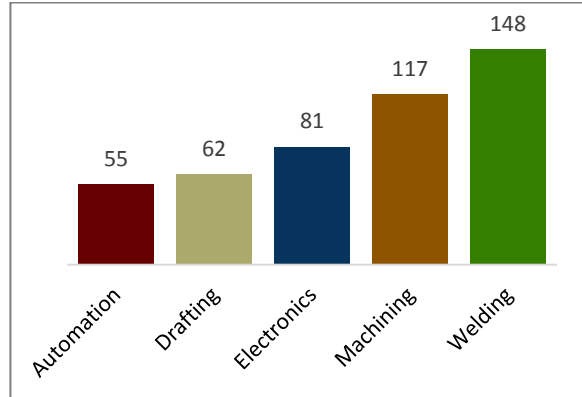
Exhibit 4.8 and 4.9 present the number of pre-participants and participants, respectively, in each program of study as of the end of the grant period. Exhibit 4.10 shows the number of individuals enrolled in the program by target population (veterans, TAA eligible, WIOA/WIA eligible).

**Exhibit 4.8: Pre-Participants by Program of Study**



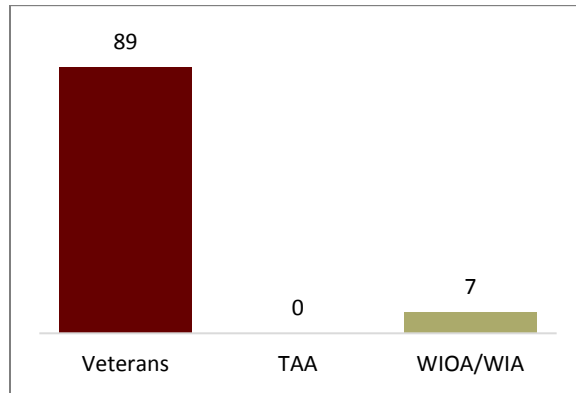
N=85

**Exhibit 4.9: Participants by Program of Study**



N=463

**Exhibit 4.10: Students from Target Populations**



*Note:* Number of WIOA/WIA eligible participants was provided by AzAMI. N=548, including 463 participants and 85 pre-participants.

## 4.4 Program Initiatives

In addition to the major program components described above, the AzAMI program developed a number of initiatives intended to enhance the student experience and facilitate education and training opportunities for current and future students.

### 4.4.1 Technology-Enabled Learning

Efforts to make student learning and coursework more flexible and accommodating, especially for nontraditional students balancing work and family life demands, have led to the adoption of technology-enabled learning tools. AzAMI used Tooling U, an online competency-based learning curriculum, to supplement certain entry-level machining courses.<sup>34</sup> A major benefit of Tooling U is that it allows students to work through the course curriculum at their own pace. All students enrolled in AzAMI programs have access to labs outside of

“I have to spend \$300 for tuition plus lab fees and then I have to buy this membership [Tooling U] for one semester for some online website to get the information and pass the course, but then I never have access to that information again. When I have a book, I put it on my bookshelf and can always refer back to it. And the information is nowhere near as in-depth as what is in a textbook.”

— AzAMI student

normal class hours to work on projects, including Tooling U projects, under staff supervision. Another benefit of Tooling U is that it eliminates the need to purchase textbooks in five or six classes. At an annual cost of \$175, Tooling U is significantly less expensive than textbooks.

Despite these potential benefits, students reported that while they appreciated the idea of saving money on textbooks, they found the content of Tooling U to be poor and, in many cases, not applicable to their program of study. In addition, students noted that the backend functions did not work well for faculty. They said that class instructors often asked them to print out their course scores and grades because faculty members cannot use the Tooling U system to monitor student progress.

AzAMI faculty and staff also noted that some faculty use Canvas, which offers similar functions. Students provided more positive feedback on Canvas than on Tooling U, but it appears that this software is used by fewer faculty.

### 4.4.2 Articulation Agreements

Another initiative of the AzAMI program was the development of articulation agreements with other educational institutions to enable students to build on the credentials earned at AzAMI to further their education. AzAMI has articulation and transfer agreements with the Maricopa Skills Center and the Southwest Skills Center. These career and technical centers offer training hours rather than course credits. Under the articulation agreements, students at the centers are able to transform noncredit training hours into as many as 34 credits at MCC.

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<sup>34</sup> MCC was awarded the Tooling U-SME Platinum Education Center designation.

With the goal of offering students the opportunity to build upon their AzAMI associate degrees, faculty and staff developed articulation agreements with four-year colleges. AzAMI currently has an articulation agreement with Northern Arizona University (NAU). A student with an associate of applied science degree from MCC will transfer seamlessly to a bachelor's degree program in applied science at NAU.

In addition, AzAMI staff emphasized the importance of developing articulation agreements with the K-12 system. They explained that addressing employer skill needs requires that K-12 system to begin preparing students for jobs in manufacturing early on and offer students the opportunity to earn credits toward an associate degree while in high school. They further noted that while TAACCCT funding does not cover activities related to working with the K-12 system, the program staff understand the importance of such efforts and have implemented these activities using other resources.

#### **4.4.3 Prior Learning Assessments**

AzAMI students with previous education or work experience can place out of AzAMI courses through informal prior learning assessments. Students are referred by MCC's academic advising department or by the career navigator for one-on-one assessments or tests conducted by faculty members. These assessments allow faculty to measure students' knowledge in their field. In addition, their previous education transcripts are examined for potentially transferable credits.

Boot camps are another method of measuring prior education and work experience that are specifically related to the content of the boot camp. Boot camps focus on providing participants with the opportunity to demonstrate their knowledge, skills, and abilities in order to earn credentials. Boot camp participants can now earn credits towards AzAMI programs of study in the form of prior learning credits.

#### **4.4.4 Partnerships**

AzAMI staff and program faculty have made significant efforts to build and leverage strong partnerships with community stakeholders, the workforce system, education and training organizations, and employers. These partnerships have led to a broader outreach and recruitment effort, improved course offerings, more hands-on learning opportunities, and opportunities for student placement and employment.

As part of the effort to engage program partners, AzAMI program staff developed two partner groups, the advisory team and the executive committee, to provide input on the program and guide programmatic decision making. The advisory team was created as a mechanism for gathering high-level input on program development and implementation from 180 group members. The executive committee, a 52-member group of partners, was formed to implement specific AzAMI action items such as creating marketing tools, developing partnerships, and planning AzAMI events. Both groups include representatives from community colleges and public



schools, workforce and economic development agencies, and local government as well as from manufacturing companies and industry organizations.

### **Workforce Partners**

AzAMI is working with a strong team of workforce partners to serve students by connecting MCC with the workforce development system, employers, and municipal and statewide economic developers.

*Arizona@Work Maricopa County (AWMC)*<sup>35</sup> is helping to link employers with AzAMI and offering the AzAMI program as a training option to job seekers. According to one AWMC representative, WIOA shifted the focus of workforce development even more than previous legislation toward serving the needs of employers. AWMC representatives who work with employers have made extensive efforts to educate employers about the types of education and training available through AzAMI. Employers are directed to AzAMI as both a source of new employees and an option for training incumbent workers. AWMC also helps to address employers' concerns about partnering with education and training providers like AzAMI to offer internships and apprenticeships. The AWMC representatives noted that the Business and Industry Leadership Team (BILT) meetings are very useful for sharing information about AzAMI with employers and for recruiting employers for the AzAMI advisory team.

When suggesting AzAMI as a training option, AWMC staff can offer WIOA funding to eligible job seekers. Because MCC is an eligible training provider under WIOA, individual training accounts can be used to pay for AzAMI programs. AWMC can also provide WIOA-funded students with money for training, textbooks, clothing, tools, and gas cards. The career navigator can help students access these funds.

MCC is an eligible training provider under WIOA, which means that WIOA individual training accounts can be used to pay for students to take AzAMI courses.

AzAMI also developed a partnership with the *Arizona Department of Economic Security, State Apprenticeship Office (SAO)*. Apprenticeships require work experience and educational credits for completion. SAO can enroll apprentices into AzAMI, where they would earn educational credits. The SAO apprenticeship coordinator works with industry employers to ensure that the program curricula meet their needs. The coordinator also connects AzAMI with employers in order to link current students with apprenticeships. To date, however, none of the nine AzAMI students placed in apprenticeships were enrolled in AzAMI through the SAO.

Another initiative of the SAO apprenticeship coordinator was to assist MCC in becoming a member of the Registered Apprenticeship College Consortium (RACC) in 2015. RACC members agree to accept the college credit value of the Registered Apprenticeship Completion Certificate,

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<sup>35</sup> Previously Maricopa Workforce Connections

which facilitates between member colleges the transfer of credits earned from apprenticeships.<sup>36</sup>

The Economic Development Community–*Greater Phoenix Economic Council (GPEC)* and the *Arizona Commerce Authority (ACA)* have partnered with AzAMI to be part of their business retention and attraction team when recruiting new employers to the state. The AzAMI executive director has made presentations to manufacturing sector employers who are looking for information on workforce pipeline and skill sets when deciding whether to locate in Arizona. This partnership includes activities such as presentations, tours, planning data, and team site visits. Having access to information on local talent, competencies, and specialized training needs has been of value to the economic development efforts of the state.

"AzAMI staff have been very responsive to our needs and requests."

— *Employer*

### Employers

A major goal of the AzAMI program is to become a "one-stop shop" for industry employers' training and recruitment needs. To accomplish this, AzAMI staff developed partnerships with a number of

industry employers in the Mesa area, including Boeing, TRW, Modern Industries, Trans-Matic, and Young Electric Sign Company. Many AzAMI staff and faculty members commented that employer involvement is the driver of AzAMI. AzAMI's methods for involving employers in program development and implementation are described in Exhibit 4.11.

### Exhibit 4.11: Mechanisms for Employer Involvement

AzAMI faculty and staff have worked successfully to involve employer partners through the program mechanisms listed below.

- **AzAMI advisory team.** Employers can provide input on program development and implementation as members of the AzAMI advisory team.
- **Customized curricula and courses.** AzAMI offers employers customized training courses, including boot camps, which can be delivered on-site at the employer's facility or at AzAMI. AzAMI also works directly with industry trade associations and other groups, including the Arizona Technical Council, to align its programs and courses to the needs of industry.
- **Program advisory committees.** Each academic program in AzAMI has an advisory committee, separate from the AzAMI advisory team, whose members are local employers. These committees provide input on curricula and equipment purchases to ensure that the programs provide students with the skills employers need. The agenda for the AzAMI Manufacturing Forum meeting in April 2016 is presented in Appendix F.
- **Career fairs and other events.** Employers are invited to participate in AzAMI events such as traditional and reverse career fairs that help them recruit qualified job candidates. Employers are regularly invited to participate in tours and showcases of AzAMI facilities.
- **Equipment.** Several employers have donated advanced equipment to AzAMI programs.

### Other Partners

<sup>36</sup> [https://doleta.gov/oa/pdf/RACC\\_FAQs1.pdf](https://doleta.gov/oa/pdf/RACC_FAQs1.pdf)

In addition to its workforce and employer partners, AzAMI collaborates with additional partners to conduct extensive outreach as a means of engaging the workforce pipeline and further developing programmatic offerings. Three important partners are described below.

AzAMI contracted with the Science Foundation of Arizona (SFAZ) to develop partnerships with industry employers. SFAZ is a 501(c)(3) nonprofit working to ensure that the education system creates a workforce that meets the needs of employers in industries related to science, technology, engineering, and math (STEM). SFAZ is leveraging its industry knowledge and relationships to identify and engage employers that could benefit from a partnership with AzAMI. Throughout the grant period, SFAZ has worked to identify effective methods for employer engagement. SFAZ representatives explained that effective employer engagement is a challenging exercise that often proceeds by trial and error. They reported that offering AzAMI tours, with the opportunity to review program curriculum, has been a successful method for conveying to employers the quality of the program content and instructors.

AzAMI is working with another partner, Arizona Precision Manufacturing Apprenticeship Program (AZPMAP), to create apprenticeship opportunities for AzAMI students. AZPMAP is a registered manufacturing apprenticeship program that engages with employers in manufacturing to develop customized apprenticeship programs. AZPMAP then identifies and screens qualified candidates for those programs. AzAMI and AZPMAP have a mutually beneficial relationship. AZPMAP links AzAMI students with apprenticeships, and AzAMI helps those apprentices to meet the academic requirements of their apprenticeship programs. AZPMAP is also involved in career fairs and events to showcase and market AzAMI programs and services. All nine AzAMI students who participated in apprenticeships were placed through AZPMAP.

As discussed earlier, AzAMI partnered with Chandler Gilbert Community College to develop and implement boot camps. According to AzAMI staff, this collaboration was beneficial for both parties, because it allowed them to share equipment and balance faculty teaching hours.

Appendix G provides further information about the range of AzAMI partners.

## **4.5 Program Management and Sustainability**

With the full support of MCC's president, the AzAMI executive director works closely with faculty and staff to develop, implement, and manage all components of AzAMI. The core management activities outlined below demonstrate the importance of having a strong executive director, who is innovative and flexible.

### **4.5.1 Spearhead Program Initiatives**

The executive director is responsible for ensuring that all programmatic goals are met. She works with the appropriate internal partners such as AzAMI faculty, staff, and leadership as well as with external partners such as community leaders, education networks, and workforce, and other government agencies to plan and implement all program components and initiatives. With the

support of a strong team, the executive director has been successful in achieving many program goals and milestones.

#### 4.5.2 Conduct Program Outreach and Partner Engagement

The executive director oversees all program outreach, including student recruitment, and all partner engagement activities. Together with program staff, she plans and implements outreach events to create recognition for AzAMI in the community, acts as a convener to grow and maintain sector-driven partnerships, and offers continuous engagement opportunities such as the advisory team and executive committee meetings to build greater collaboration and leverage resources. Bringing the right partners to the table along with AzAMI faculty and staff is essential to achieving program goals. AzAMI faculty, staff, and partners all agreed that the executive director has been very successful in connecting the right partners to successfully implement program initiatives.

#### 4.5.3 Provide Student Support

The executive director collaborates closely with faculty and manages the career navigator and other staff as they support students in planning and completing their programs of study. Students spoke highly of the support they have received from the career navigator and their instructors. In addition, the career navigator and the faculty complimented each other, noting their great appreciation for the other party's knowledge and skills and for the support all parties give students.

#### 4.5.4 Develop a Sustainability Plan

One employer noted that creating a steady stream of students who have completed the program and are ready for employment, rather than waiting for employers to express their needs, will help sustain the program. "Sometimes, when a need arises, we don't have time to wait for students to take a course or program. We need them right away."

MCC leadership is committed to sustaining AzAMI, because the program is aligned with a number of the school's strategic priorities.<sup>37</sup> MCC has therefore approved a plan to sustain the AzAMI program when TAACCCT grant funding ends on September 30, 2017.

To develop a sustainability plan, the AzAMI team put together a list of considerations to help facilitate a dialogue on which program components and best practices should be sustained and how to sustain

them. Program partners explained that they are aware of the importance of sustainability planning; many noted that they are working to identify new resources that can be leveraged to support the program. One notable effort is to align the AzAMI curricula with high school programs that offer dual enrollment with MCC. This effort will help to lock in a flow of new students into the program.

AzAMI staff have continued to look for new opportunities to improve and expand the program and identify funding sources. Staff are currently working toward becoming a Center of Excellence with leveraged funding through June 2018. In addition, AzAMI is collaborating with other community colleges, the State Commerce Authority, and economic development organizations

<sup>37</sup> <https://www.mesacc.edu/about/vision-mission-values-learning-outcomes>

to map program curricula to a common core of capabilities to meet employers' skill needs. Staff members understand the importance of this collaboration, which allows for efficiencies and specialization among the schools and avoids duplication of efforts and program offerings. Working with other community colleges to create a menu of offerings to employers will allow AzAMI to become an expert in advanced manufacturing training that employers can rely on. This effort will further contribute to the program's sustainability. Staff have also been successful in leveraging an additional \$510,000 in funding to support the AzAMI program. These additional funding sources are described below.

- AzAMI industry partners Boeing and Trans-Matic donated \$15,000 to be used for student industry certifications.
- Walmart donated \$15,000 in scholarship funding.
- AzAMI received \$400,000 in state STEM funding for additive manufacturing equipment and supplies.
- The program received \$30,000 in Early College STEM funding for additive manufacturing summer workshops.
- A Marley grant of \$50,000 was made to support AzAMI staffing and provide resources for technical assistance.

In addition, the positions of the executive director and the career navigator will be funded by Proposition 301 funds from the State of Arizona beginning October 1, 2017 through October 31, 2020.

## **4.6 Implementation Study Findings Summary**

As part of the TAACCCT grant, AzAMI staff and program partners improved and expanded program offerings, developed and implemented manufacturing boot camps, provided intensive student support through the activities of the career navigator, and conducted extensive outreach, recruitment, and engagement efforts with employers and other partners. This section first documents challenges that the program staff encountered during grant implementation and the evaluation team's recommendations to address those challenges. Next, the successes identified during the site visits and regular check-in meetings with program staff are discussed.

### **4.6.1 Program Challenges**

This section discusses the challenges identified since the initial site visit. Recommendations that may help to address each challenge are provided.

#### **Course Availability/Scheduling**

Students expressed frustration with the limited availability of AzAMI courses, noting that advanced courses required to complete their programs of study were often the hardest to get into. Some students reported that they had to take classes that they didn't need just to maintain the course load required for financial aid. Students also cited situations in which they enrolled in

courses only to have them cancelled due to low enrollment. Adding to this frustration is MCC's lack of an add/drop period that would have allowed students to enroll in a different class if one of their classes was cancelled.

**Recommendation:** It is important to note that this challenge is, in large part, a result of MCC's college-wide policies rather than issues with the AzAMI program's implementation. However, there may still be opportunities for AzAMI faculty and staff to alleviate the challenges that result from these policies.

One solution that might help to prevent courses from being dropped due to low enrollment would be for the career navigator and faculty to work together to identify students who need to take specific advanced courses in the next two or three semesters, and coordinate course offerings and student enrollment. This solution would take advantage of the relationship the career navigator has with both students and faculty to help ensure sufficient enrollment in advanced courses to prevent cancellation. Lowering minimum enrollment requirements for advanced courses would also help to address this challenge, but AzAMI staff likely cannot make this change independently of the MCC administration.

### **Tooling U**

Students provided very negative feedback on Tooling U. Students agreed that the course content is of poor quality and encourages rote memorization of course material rather than learning. Students noted that, although the Tooling U fee is less than the cost of textbooks, they cannot access the content once they have completed the course, as they can with books. Students also reported that the user interface is difficult for both students and faculty to use.

**Recommendation:** The evaluation team recommends limiting the use of Tooling U to introductory classes. For those courses, students should also be provided with some hard-copy course materials that they can use after the class ends. AzAMI staff and faculty may also wish to consider alternative online learning tools.

### **Career Pathway Documentation**

AzAMI piloted the Viridis software tool to help students navigate the AzAMI program, learn about career pathway options, and plan their coursework. While Viridis is a useful tool, it was only available to current students and required that they log in and learn to use it. The Viridis pilot eventually led to what is now a college-wide software product, NACE Link, which will be used for the same purpose of connecting students with potential employers, but in a more efficient manner.

**Recommendation:** The evaluation team recommends the creation of documentation that graphically illustrates the AzAMI career pathways and how they align with AzAMI course offerings. Career pathway graphics will clarify for prospective students the careers that they can pursue through the AzAMI program and the courses they need to take to earn the required certifications and credentials. Career pathways graphics will also help

students develop short- and long-term academic plans and prevent costly mistakes, such as taking a course that is not required for a specific credential or degree, or a course that will not transfer to a four-year institution. In addition, these resources can serve as tools for program recruitment and employer engagement because they are easy-to-use program guides that demonstrate how a student can translate the skills gained through the AzAMI program into a high-paying job. The college’s adoption of NACE Link may help AzAMI participants choose their career pathway and better plan their coursework.

#### 4.6.2 Program Successes

Since the initial site visit, AzAMI faculty and staff, together with their partners, have built on early program successes to implement a high-quality education and training program. This section highlights significant successes in implementing the AzAMI program.

##### AzAMI Faculty and Staff

It is clear that much of AzAMI’s success is due to the strong team of faculty and staff that support the program. The executive director, career navigator, and instructors are committed to implementing a high-quality program that supports students as they complete their coursework and prepares them to be productive employees. The strong AzAMI team points to the obvious, yet critical, best practice of bringing together a group of well-qualified, outgoing, and experienced individuals, which is essential in implementing a successful program.

When thinking about replicating a program like AzAMI, it may be helpful to understand the staffing that is required. The AzAMI staff referenced throughout the report are only 2.5 full time equivalents (FTEs), which include the executive director, career navigator, and a part-time administrative assistant in addition to the program faculty/instructors. The contributions of the college institutional research staff, grants accountant, and Dean of Career and Technical Education (CTE) were all in-kind for approximately 10 percent of their time.

##### Program Recruitment and Outcome Goals

AzAMI staff exceeded the specific recruitment and outcome goals laid out in the MCC TAACCCT grant application. Exhibit 4.12 presents the target and actual numbers associated with the four measures presented in the grant application. Of note, AzAMI served a total of 463 participants, about 60 percent more than the goal of 290.

**Exhibit 4.12: Participant Recruitment and Outcome Goals**

Recruitment and Outcome Goals	Target	Actuals
Total Unique Participants Served	290	463
Total Number of Participants Completing a TAACCCT-Funded Program of Study	206	218
Total Number of Participants Completing Credit Hours	206	218
Total Number of Participants Earning Credentials	206	218



## **Boot Camps**

Developing and implementing the AzAMI boot camps in collaboration with employers and Chandler Gilbert Community College is one of the major accomplishments of the AzAMI program. Boot camps offer current and potential students, incumbent workers, and job seekers the opportunity to demonstrate and improve their existing skills in order to earn industry-recognized certificates, certificates of completion, and college credit. In addition, these programs strengthen relationships with employers and serve as a recruitment mechanism for students. The fact that boot camps create a win-win situation for students, employers, and AzAMI should make preserving this training program beyond the TAACCCT funding a priority.

## **Outreach and Partnership Development**

AzAMI faculty, staff, and partners have made a comprehensive effort to conduct outreach and develop partnerships with industry employers and stakeholders. The team used existing partnership engagement methods, including program advisory committees, and has also developed new methods including social media campaigns, events such as Manufacturing Day, an advisory team, and targeted outreach to individual industries and employers. These extensive efforts enabled the program to:

- Gather industry input on how to develop and improve curricula;
- Spread the word about the value of the AzAMI program and the high-quality skills of the students;
- Recruit new students; and
- Identify additional resources that can be leveraged to achieve programmatic goals.

## **Creative Solutions**

The AzAMI team has also demonstrated the ability to be flexible and to identify creative solutions to implementation challenges. A notable example is the team's decision to incorporate robotic welding modules into existing curricula rather than develop a separate robotic welding program. This adjustment, which added value to an existing program, was made after determining that there was not sufficient industry demand for a robotic welding certification to justify the investment in developing a new program as originally planned. Mid-course adjustments such as these save program resources and add value.

Another creative solution instituted by program staff was developed to support more students in taking the AzAMI certification tests. In reviewing program data, the program staff realized that a smaller than expected number of students were taking the program certification tests. After talking to a number of students, staff determined that the primary reason for the limited participation in the certification tests was the associated costs of the tests. In response to this issue, the staff worked to leverage non-grant resources from Boeing and Walmart to reimburse students once they completed testing. This solution helps students earn the credentials they need, improves outcomes for the AzAMI program, and provides employers with the credentialed applicants they are looking for.

## **Leveraging Resources**

AzAMI program staff, especially the executive director, have worked diligently to identify and leverage additional resources, including both public and private grants, to expand AzAMI program offerings, support students more intensively, and contribute to the program's sustainability. These important efforts have reinforced the program's connection with the community and helped to ensure that the program will continue to be an important part of MCC's offerings.

### **4.6.3 Summary of the Implementation Study Findings**

The implementation study findings demonstrate that the AzAMI program is being implemented by a strong team of MCC faculty and staff in collaboration with a growing network of education and training providers, employers, and community stakeholders. The AzAMI program is providing education and training in aerospace and advanced manufacturing through traditional classroom and laboratory instruction as well as in boot camps that provide short-term training. In addition, the career navigator provides academic support services to students to help them enroll and succeed in the newly enhanced and expanded AzAMI courses and programs of study. AzAMI staff are also continuing to strengthen relationships with program stakeholders, including workforce development representatives, local education and training providers, and employers.

MCC has achieved many of its goals for the AzAMI program by successfully leveraging highly qualified program faculty and staff to improve course offerings and student support, develop and implement boot camps, and conduct extensive program outreach to foster and build relationships with industry and other program stakeholders. AzAMI's strong relationships with industry and program stakeholders will also help ensure the sustainability of the program.

As with all new programs, challenges with implementation were encountered. Students have noted frustration with limited AzAMI course availability, and expressed their dislike of the online instruction resource Tooling U. Another participant point of frustration was the inability to earn college credit toward their program of study through boot camps. AzAMI modified the program so that boot camp participants can now earn credits toward their program of study through prior learning credits. Another challenge, reported by program faculty and staff, was that, in some cases, it was difficult to accurately gauge employer demand for specific skill sets during the short start-up phase of the grant, though real-time adjustments were made to program plans to account for any miscalculations. The lack of quick reference career pathways documentation has also been identified as a program limitation that may affect students' ability to navigate the program, but this was addressed institutionally through a product called NACE Link, a platform for guided pathways and employer connections.

Despite these challenges, the AzAMI program appears to be providing education and training that prepares students to meet industry skill needs, and program staff have successfully developed a sustainability plan to maintain the most successful components of the program going forward.

## 5. CHARACTERISTICS OF THE AZAMI PROGRAM

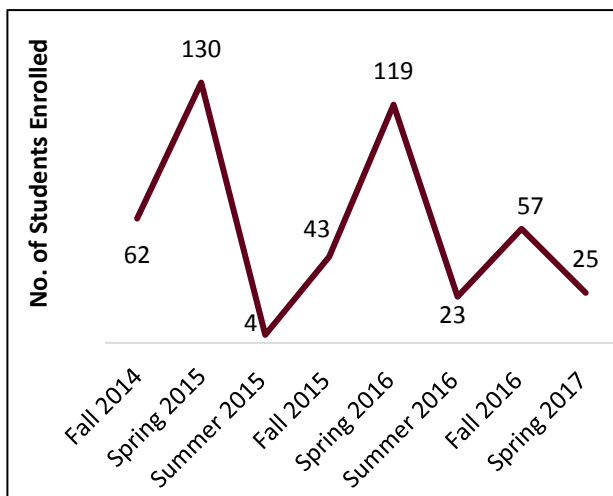
This chapter describes the characteristics of the AzAMI Program. The sections are organized as follows: (1) participant enrollment and student status; (2) student course load characteristics; and (3) career navigator visits.

### 5.1 Participant Enrollment and Student Status

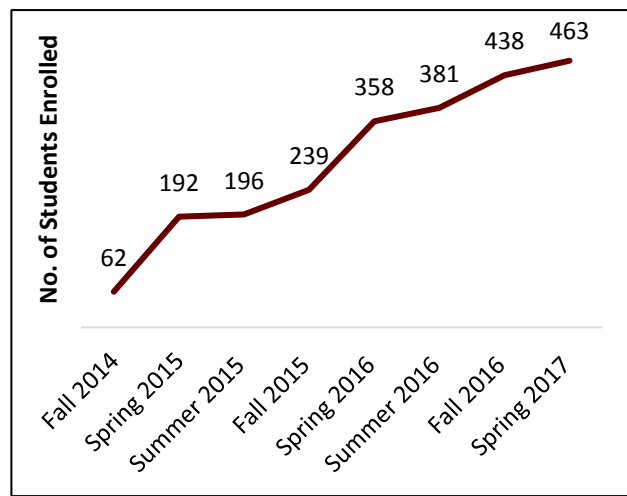
This section analyzes participant enrollment trends from Fall 2014 to Spring 2017, including the proportions of participants by status as new, former or continuing students at MCC; enrollment trends by program of study; and the proportions of completers, current participants, and exiters.

The AzAMI program began enrolling participants in the five programs of study in Fall 2014. Enrollment was highest in Spring 2015 and lowest in Summer 2015 (Exhibit 5.1). About 82 percent of participants were enrolled between Fall 2014 and Summer 2016 (Exhibit 5.2). Between Spring 2015 and Spring 2016, the number of participants almost doubled, from 192 to 358.

**Exhibit 5.1: Enrollment by Semester**



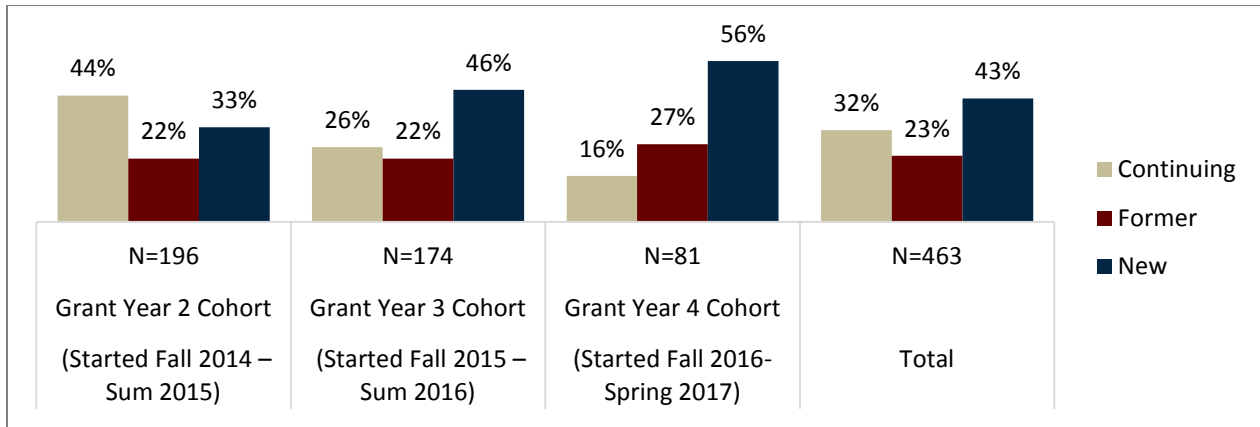
**Exhibit 5.2: Cumulative Enrollment**



Note: As of July 2017. N= 463. Pre-participants are excluded from this table because they do not have an enrollment semester.

Regarding participant status, 43 percent of the participants were new to MCC, 32 percent were continuing students, and 23 percent were former students (Exhibit 5.3). Continuing students are defined as those who attended the previous semester; former students skipped one or more semesters.

**Exhibit 5.3: New, Former, and Continuing Students by Grant Year Cohort**

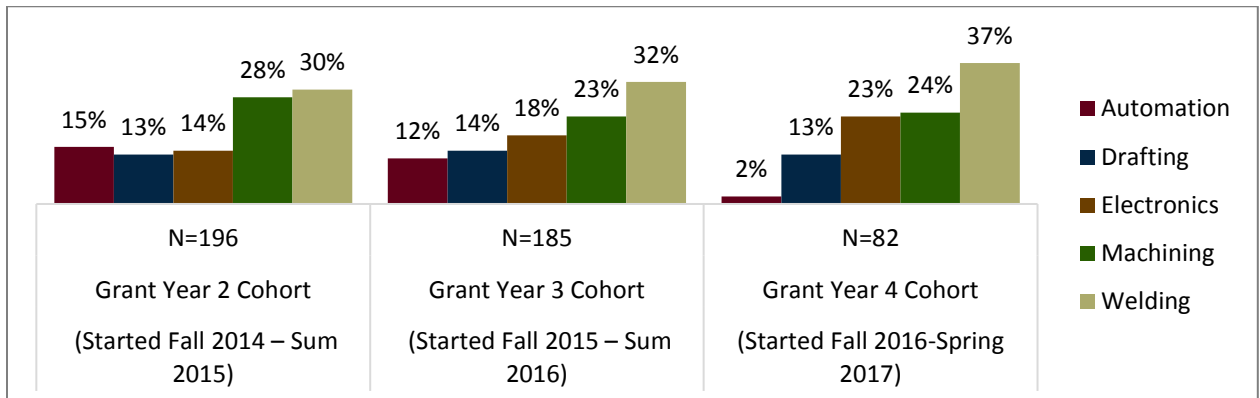


*Note:* As of July 2017. N=463. Pre-participants are excluded because they do not have an enrollment semester. New, former, and continuing student status was missing for 6 percent of AzAMI participants in grant year 3, 1 percent in grant year 4, and 3 percent overall.

In grant year 2 (Fall 2014–Summer 2015), 44 percent of participants were continuing students, while 33 percent were new students. The proportion of new students as a percentage of total participants in a grant year rapidly increased across grant years while the proportion of continuing students decreased. For instance, the proportion of new students increased from 33 percent in grant year 2 to 46 percent in grant year 3 and 56 percent in grant year 4. At the same time, the percentage of continuing students decreased from 44 percent in grant year 2 to 26 percent in grant year 3 and 16 percent in grant year 4. This is not surprising: the number of new students would be expected to gradually increase as outreach efforts progressed and word-of-mouth about the program got out. The percentage of former students remained roughly the same, between 22 and 27 percent.

Of the five programs of study offered in the AzAMI program, welding was the most highly requested by students (Exhibit 5.4). About a third of the total enrollment in grant years 2 and 3 was in the welding program. In grant year 4, it increased further to 37 percent.

**Exhibit 5.4: Student Program of Study by Grant Year Cohort**

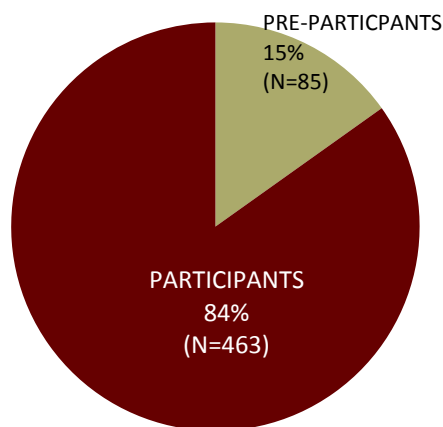


*Note:* As of July 2017. N=463. Pre-participants are excluded because they do not have an enrollment semester. Year cohorts were constructed by the first semester that the student enrolled in AzAMI.

Machining was the second most popular program, with 28 percent of students in grant year 2 opting for it, and about 23 and 24 percent of students in grant years 3 and 4, respectively. In electronics, too, the percentage of students increased across grant years, from 14 percent to 23 percent, perhaps due to boot camp participation in this field of study. Another 13 percent of students in each grant year selected the drafting program. In contrast, student enrollment in the automation program fell dramatically, from about 15 percent in grant year 2 to 2 percent in grant year 4. This was likely due to the loss of faculty in the automation program, requiring AzAMI to restructure the program in the last year of the grant.

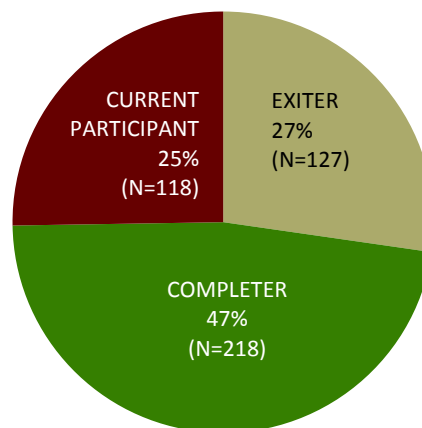
The chart in Exhibit 5.5 breaks out AzAMI students by participant and pre-participant status. As of July 2017, the AzAMI program had 463 participants and 85 pre-participants. Pre-participants and participants were both eligible to receive the same program services. The main difference is that participants were included in the reporting to the U.S. Department of Labor. As mentioned in Chapter 4, AzAMI set out clear criteria for moving a pre-participant to participant status, based on adequate academic progress toward a program of study. Adequate progress is defined as successfully completing at least 75 percent of the credit hours for which the student enrolled during the previous semester and declaring a program of study.

**Exhibit 5.5: AzAMI Program Student Status**



Note: N=548. As of July 2017.

**Exhibit 5.6: AzAMI Student Participation Status**



Note: N=463. As of July 2017.

The chart in Exhibit 5.6 disaggregates participants by program completion status. As they move through the program, AzAMI participants are assigned a status of completer, exiter, or current participant. About half (47 percent) of participants were completers, and 27 percent were exiters. The different participant status types are defined as follows:

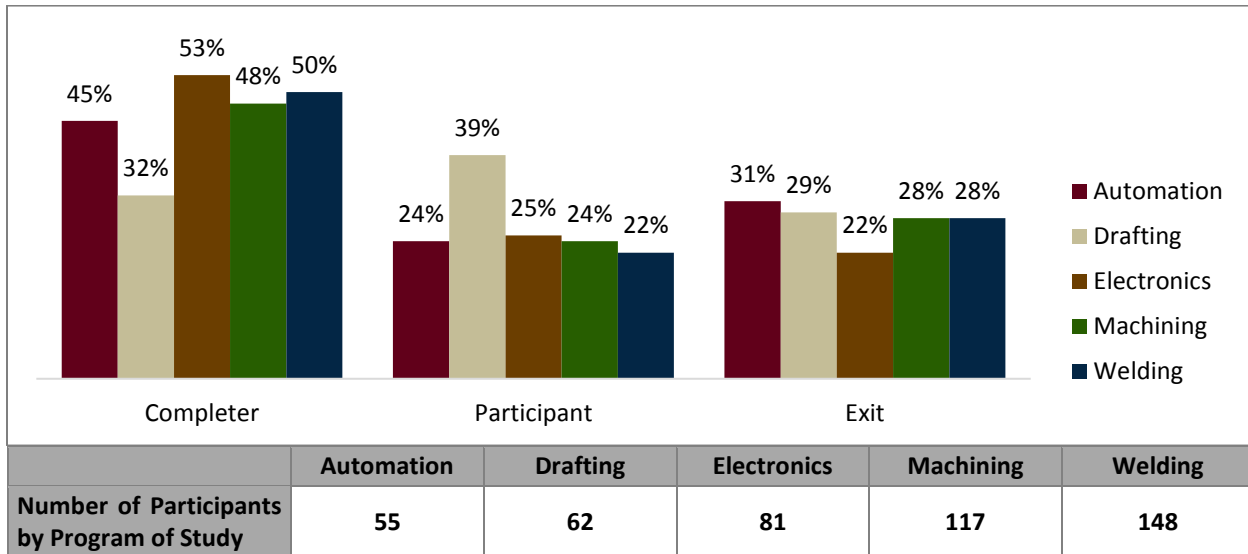
- **Completers.** Students who have earned an AzAMI credential (industry certificate, certificates of completion (CCL), and an associate in applied science (AAS) degree).<sup>38</sup>

<sup>38</sup> Students could be completers and still pursuing other awards at MCC. In such cases, we counted these individuals only once, as a completer.

- **Exiters.** Students who did not earn an AzAMI credential and missed more than one sequential semester taking AzAMI courses.
- **Current participants.** Students who have not yet earned an AzAMI credential and have not missed more than one sequential AzAMI semester taking AzAMI courses.

The final program status of AzAMI participants, as of July 2017, is fairly evenly distributed across different programs of study, despite the variation in cohort sizes (Exhibit 5.7).

**Exhibit 5.7: Participant Status by Program of Study**



Note: As of July 2017. N=463. Bars of the same color (program of study) add to 100 percent. Pre-participants are excluded from this table because they do not have a declared program of study.

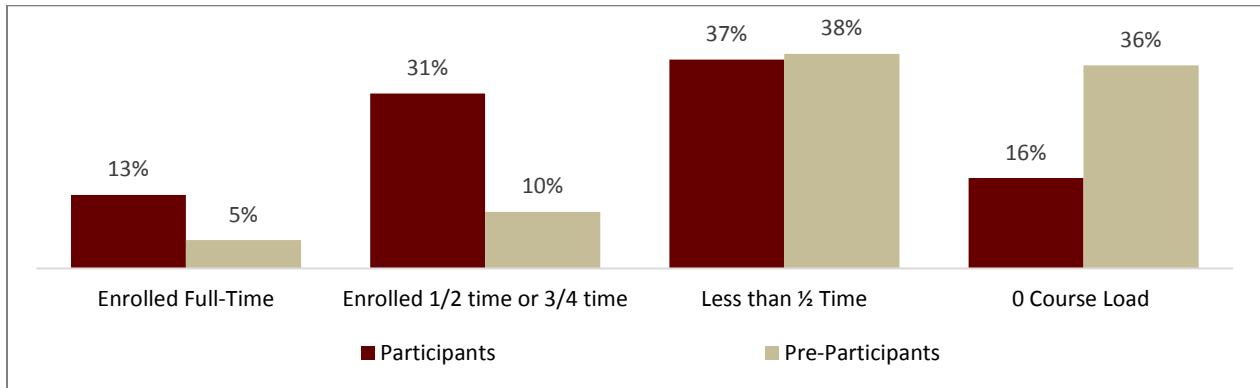
The rate of exiters was about 30 percent across most programs of study, and the completion status ranged from 45 to 53 percent. The electronics program has the highest completion rate (53 percent) and the lowest exit rate (22 percent). Notably, all boot camp participants earned industry certificates and therefore were considered program completers. Boot camps were offered in electronics and automation, and this may at least partially explain the higher completion rates in the electronics program. Drafting, on the other hand, did not have embedded boot camps or industry certificates, which may explain the lower completion rate relative to other programs of study.

## 5.2 Student Course Load Characteristics

This section describes the intensity at which AzAMI students pursued their AzAMI awards, based on course load in the last semester enrolled, average number of semesters completed, and number of credit hours accumulated. The data are presented for all students, including pre-participants.

In the last semester in which they attended MCC, most AzAMI participants and pre-participants were enrolled less than full-time, indicating that a large majority of students enrolled in the AzAMI program were going to school part-time and may be working (Exhibit 5.8).<sup>39</sup>

**Exhibit 5.8: Student Course Load in Last Semester Enrolled at MCC**



*Note:* As of July 2017. N=548; 463 for participants and 85 for pre-participants. Bars do not sum to 100% because missing observations for participants (3%) and pre-participants (12%) are not represented.

The last semester enrolled was a pre-constructed variable provided to the evaluation team and represents the last term enrolled at MCC. Students can continue taking classes at MCC even after completing the AzAMI program.

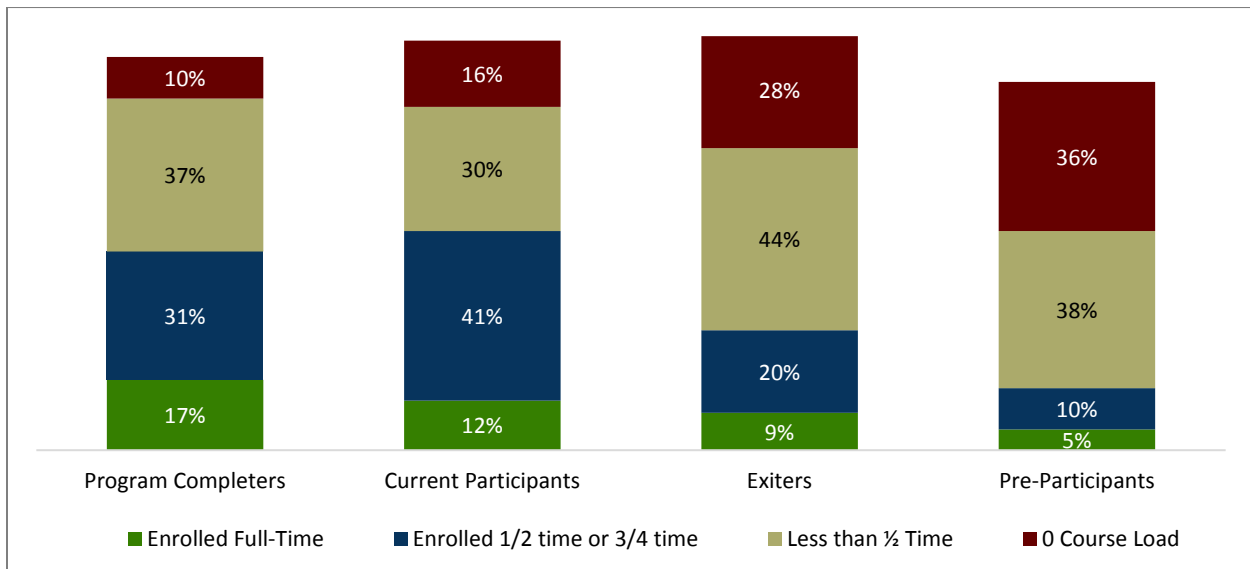
Specifically, 68 percent of participants and 48 percent of pre-participants attended MCC as part-time students (excluding those without any course load). Only 13 percent of participants and 5 percent of pre-participants were enrolled full-time.

These data show that pre-participants were less engaged at MCC. The share of pre-participants with no course load (36 percent) is more than double the rate for participants (16 percent). Students with no course load did not enroll in courses in their most recent semester at MCC.

Student course load in the last semester enrolled, by participation/completion status in AzAMI, is shown in Exhibit 5.9. It can be seen that 17 percent of AzAMI completers and 12 percent of current participants were enrolled full-time at MCC. Full-time enrollment rates were lowest among pre-participants at 5 percent, followed by exiters at 9 percent.

<sup>39</sup> Full-time is defined as 12 credits per semester.

**Exhibit 5.9: Student Course Load in Last Semester Enrolled at MCC by Student Status**



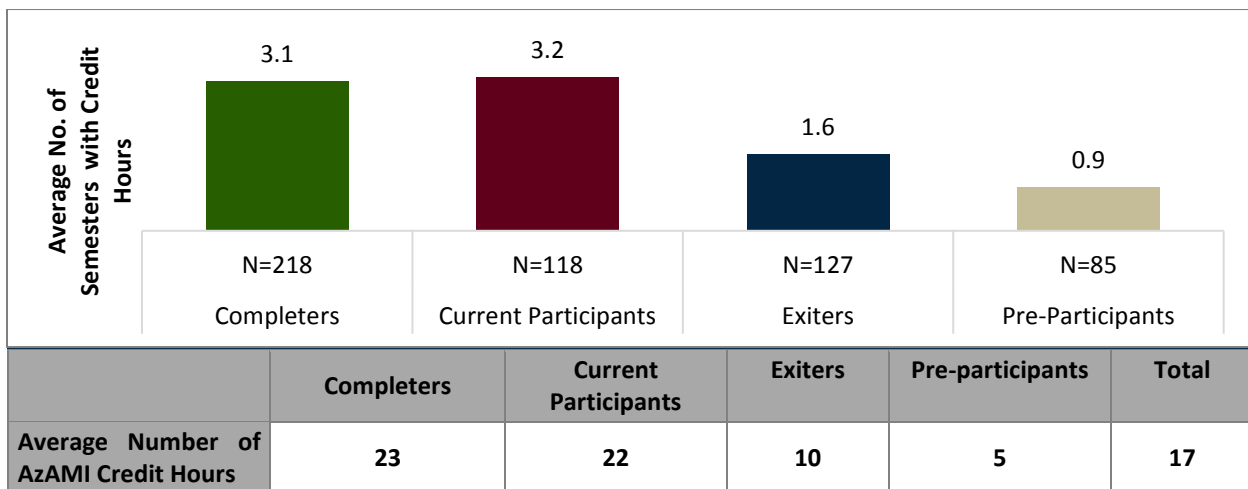
*Note:* As of July 2017. N=463 for participants and N=85 for pre-participants. Bars do not sum to 100% because missing observations (4%) are not represented. The last semester enrolled was a pre-constructed variable provided to the evaluation team.

A majority of all students were enrolled half/three-quarters time or less (68 percent of completers, 71 percent of current participants, and 64 percent of exiters). The only exception was the pre-participants, with 48 percent enrolled for half/three-quarter time or less. However, more than a third (36 percent) of pre-participants had a zero course load in the last semester compared to 10 percent of completers, 16 percent of current participants, and 28 percent of exiters. Completers may have a zero course load for several reasons. They can continue taking classes at MCC even after getting an award, or they can decide not to complete the semester. Sometimes students apply for graduation later, so awards are given the semester after a student finishes.

Exhibit 5.10 represents the average period of time (number of semesters) that students were actively engaged in the AzAMI program, by student status. The data show that program completers and current participants earned AzAMI credit hours on average for about three semesters. Program exiters had a much shorter tenure. They earned credit hours in AzAMI courses for an average of about one and a half semesters. More than half of exiters (53 percent) completed one semester or less at AzAMI. The least active category of students was pre-participants, who earned AzAMI credit hours for an average of a little less than one semester (0.9).



**Exhibit 5.10: Average Number of Semesters with Earned AzAMI Credit Hours by Program Status**



Note: As of July 2017. N=548.

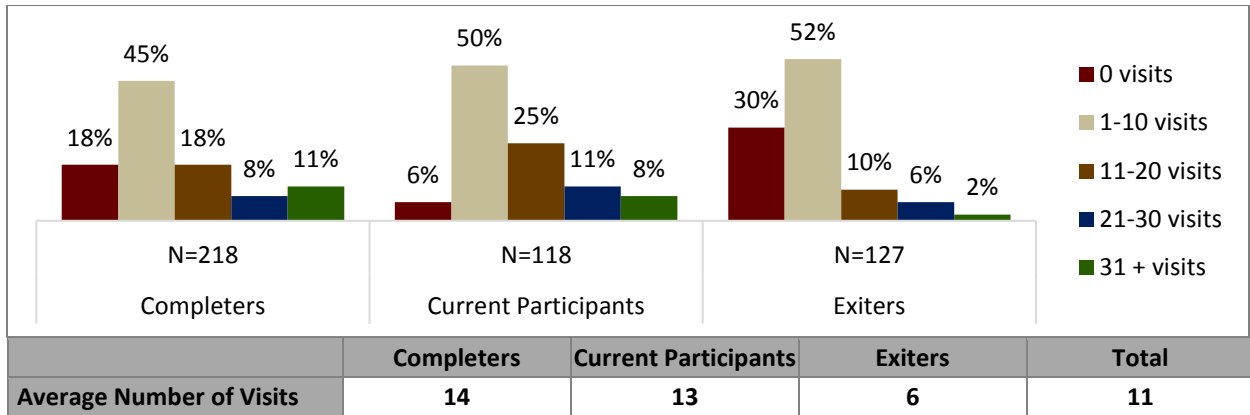
### 5.3 Career Navigator

This section analyzes the number of visits made to the career navigator by AzAMI participants. The career navigator provides academic and non-academic supports, recruits new students to AzAMI, and provides advisory case management services. In addition, the navigator is responsible for supporting a wide variety of other student needs, including using guided pathways for building class schedules, career exploration, job placement opportunities, and résumé development. Pre-participants were not included in the data provided to the evaluation team. While they were eligible to receive career navigator services, they do not appear to have received them in any systematic manner.<sup>40</sup>

Exhibit 5.11 shows the number of career navigator visits by student participation/completion status in AzAMI. About half of all students visited the navigator between 1 and 10 times, including exiters, but 30 percent of the exiters did not visit the navigator at all. A small proportion—11 percent of completers, 8 percent of current participants and 2 percent of exiters—met with the navigator more than 30 times during their course of study.

<sup>40</sup> Though career navigator visits were tracked in AzAMI’s database, many ad hoc and hallway conversations with participants and pre-participants were difficult to capture.

**Exhibit 5.11: Number of Career Navigator Visits by Student Status**

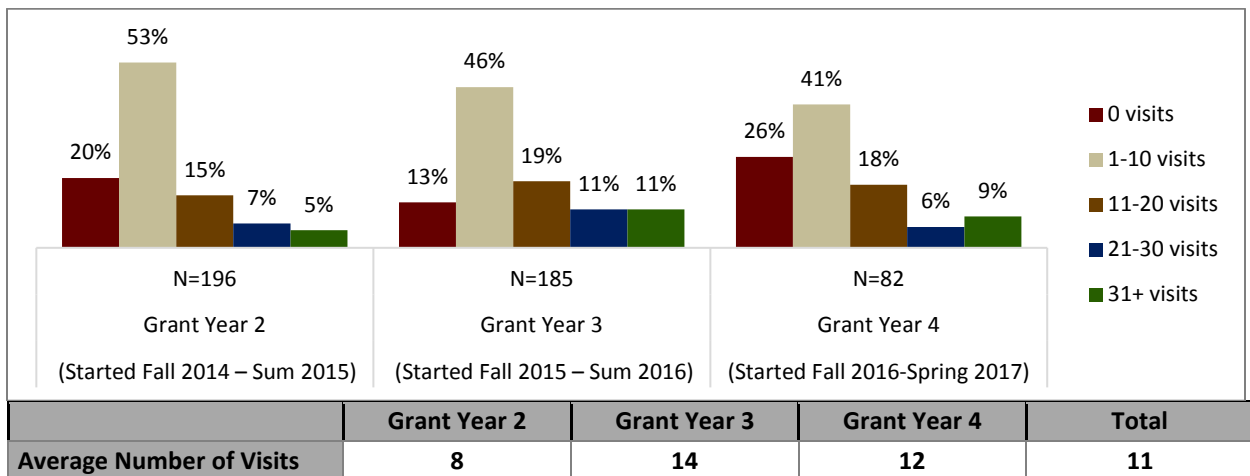


Note: As of July 2017. N=463. Pre-participants are excluded because the data did not show that they received career navigator services.

The average number of visits for program completers and participants is very similar, about 14. However, the lower number of visits paid by program exiters indicates that these students did not have much attachment to the program or its resources. The result may also be due to the fact that once students determined that they did not want to be a part of the program, they did not continue to need AzAMI resources.

Most AzAMI participants visited the navigator between 1 and 10 times in each grant year: 53 percent in year 2, 46 percent in year 3, and 41 percent in year 4 (Exhibit 5.12). However, the career navigator seems to have increased the level of engagement with students in later program years. In year 2, for example, 5 percent of participants visited the career navigator more than 30 times. This figure more than doubled, to 11 percent, in year 3. The number of visits also increased on average from grant year 2 to grant year 3, from 8 visits per participant to 14 visits (and 12 visits per participant in year 4).

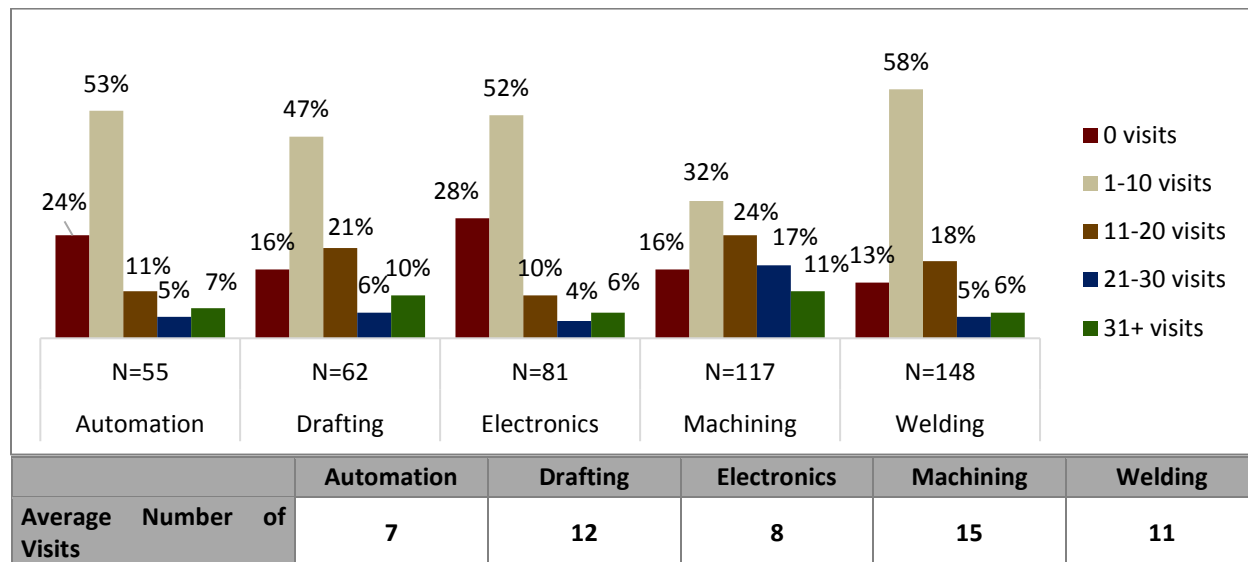
**Exhibit 5.12: Number of Career Navigator Visits by Grant Year Cohort**



Note: As of July 2017. N=463. Pre-participants are excluded because none received career navigator services. Year cohorts were constructed by the first semester enrolled in AzAMI.

Exhibit 5.13 displays the number of visits by program of study. While the largest share of students in all programs visited the career navigator between 1 and 10 times, there is some variation across disciplines. The machining program used career navigator services at the highest frequency (15 visits on average). Automation students had the lowest number of visits, with 7 visits on average. A higher frequency of career navigator visits may signal a more proactive set of students, a stronger area of focus for the career navigator, or a particularly difficult program of study, where students felt compelled to seek help.

**Exhibit 5.13: Number of Career Navigator Visits by Program of Study**



Note: As of July 2017. N=463. Pre-participants are excluded because the data did not report any career navigator services for them.

## 5.4 Summary

This chapter examined key trends in student enrollment, program status, AzAMI course load, and use of career navigator services. Some of these metrics highlight the maturation of the AzAMI program over time. For example, students increased their use of career navigator services from 8 visits on average in grant year 2 to 14 visits on average in grant year 3 (and an average of 12 visits in grant year 4). This suggests that the career navigator has been able to increase student engagement levels in the AzAMI program. In addition, the program has shifted its recruitment practices from recruiting current and former MCC students to enlisting a higher share of new students from the larger Mesa community.

The analysis of career navigator visits by student status also produced important results. Compared to exiters, completers met with the career navigator more than twice as often, and completed and earned more than double the number of AzAMI credit hours. Exiters were far less engaged than completers, and most did not complete a second semester in AzAMI. Generally, exiters made their decision to abandon AzAMI by the end of their first semester (53 percent of exiters completed one semester or less in AzAMI courses). This may be the natural course of the

AzAMI program as students determine early on that the program is not a right fit. However, this trend also points to the importance of working actively with students from the start to ensure they have appropriate expectations and the resources to succeed.

Last, there were differences between AzAMI program participants and pre-participants in the number of credit hours accumulated in AzAMI courses. Pre-participants were even less engaged in the program than AzAMI program exiters. Pre-participants earned an average of 5 credit hours in AzAMI courses and completed an average of 0.9 semesters in AzAMI courses. By comparison, exiters earned an average of 10 credit hours and completed an average of 1.6 semesters in AzAMI courses. None of the 85 pre-participants made use of career navigator services. This further signals the value of focusing resources on students who are most motivated and committed, and have a greater chance of being successful.

## 6. OUTCOME ANALYSIS

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This chapter describes the outcome analysis of the AzAMI program. The discussion begins with a description of the demographic characteristics, academic behavior, and academic awards of the participant and treatment groups. This descriptive analysis is followed by a presentation of the outcome study regression model results. The regression models measure the likelihood that the participant group would earn MCC academic awards relative to a comparison group. It is worth noting that the regression results presented in this chapter are associations and are not causal; they do not measure the impact of the AzAMI program on increasing educational outcomes.

### 6.1 Demographic Characteristics of the Participant and Comparison Groups

As defined in chapter 3, the treatment group includes students who participated in the AzAMI program during the grant period of performance. While pre-participants could enroll in AzAMI and receive career navigator services, they were excluded from the treatment group because they did not meet the program's criteria for participants: persistence and retention towards the goals of the AzAMI program, successful completion of at least 75 percent of the credits in the previous semester, and a declared program of study.

Ideally, a comparison group is identical in its characteristics and traits to the treatment group with the only difference being the receipt of treatment. Therefore, it should be as similar as possible to the treatment group in its baseline characteristics with the exception of receipt of AzAMI program services. For this study, we constructed a comparison group that matched the AzAMI program in the following characteristics: age and educational levels, and enrolled in MCC in the same time period as the treatment group. In addition, we further limited comparison group members to students who took at least one AzAMI course. This criterion was imposed to make sure that comparison group students were looking for career choices similar to those of AzAMI participants.<sup>41</sup> The comparison group of 941 MCC students met the following criteria:

- Aged 18 or over
- Had at least a high school degree or GED
- Enrolled in MCC in Fall 2014 or later
- Took at least one AzAMI course.

Exhibit 6.1 displays the demographic characteristics of the participant and comparison groups. Appendix H includes the demographic characteristics for pre-participants as well. A large majority of the participant and comparison group individuals were men (92 percent of participants and 85 percent of the comparison group). A majority of the participant and comparison group individuals

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<sup>41</sup> See Exhibit 6.2 for the number of credit hours in MCC and AzAMI courses for the participant and comparison groups. Participants earned an average of 19 AzAMI course credits while the comparison group earned an average of 6 AzAMI course credits. The highest number of AzAMI course credits earned by the participant group was 62 credits, compared to 44 credits for the comparison group.

were 35 years of age or less (69 percent of the participant group and 79 percent of the comparison group). About 60 percent of both groups were white. The comparison group had a relatively higher proportion of women (13 percent compared to 7 percent in the participant group) and younger individuals ages 18–25 (54 percent compared to 25 percent in the participant group).

A higher proportion of the treatment group compared to the comparison group was Hispanic (19 percent vs. 14 percent). Despite this, a much higher proportion of the treatment group than the comparison group spoke English as their first language (62 percent and 45 percent, respectively). In addition, 81 percent of the treatment group and 90 percent of the comparison group had a high school diploma.

**Exhibit 6.1: Characteristics of the AzAMI Participant and Comparison Groups**

Characteristic	Participant Group (N=463)	Comparison Group (N=941)
<b>Gender</b>		
Males	92%	85%***
Females	7%	13%***
<i>Missing</i>	<1%	2%
<b>Age</b>		
18-25 Years	38%	54%***
26-35 Years	31%	25%***
36-45 Years	17%	9%***
46+ Years	13%	13%
<i>Missing</i>	1%	0%
<b>Race</b>		
White	59%	60%
Hispanic	19%	14%**
Black	2%	3%
Asian	3%	4%
American Indian/Hawaiian/Other	8%	6%
<i>Missing</i>	9%	13%
<b>High School Graduation Status</b>		
High School Diploma	81%	90%***
GED Certified	12%	8%**
Home Taught	1%	<1%**
<i>Missing</i>	6%	1%
<b>First Language</b>		
English	62%	45%***
Other Than English	8%	7%
<i>Missing</i>	30%	48%
<b>Pell Recipient</b>		
Yes	34%	29%*
No	64%	71%**
<i>Missing</i>	3%	0%

Characteristic	Participant Group (N=463)	Comparison Group (N=941)
<b>Citizenship</b>		
U.S. Citizen	93%	94%
Non-citizen (legal status)	4%	6%*
Missing	3%	0%

Statistical significance: \*\*\* = at the 1% level, \*\* = at the 5% level, = at the 10% level.

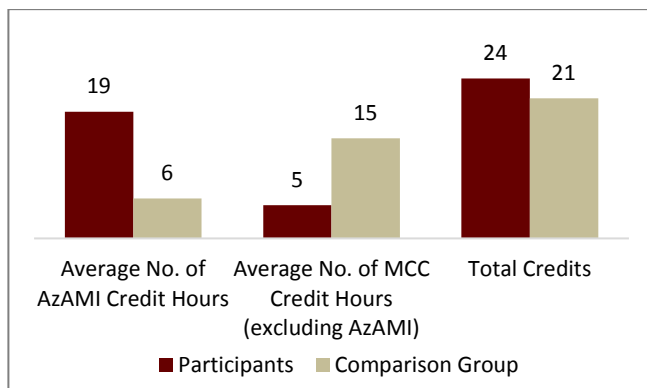
Note: The “missing” category was not compared for statistical significance across the participant and comparison groups. High school graduation status does not represent the student’s highest educational attainment at baseline. Educational attainment data were unavailable for the comparison group.

## 6.2 Academic Behavior of the Participant and Comparison Groups

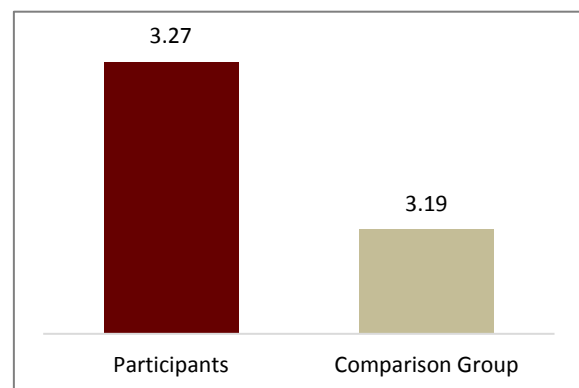
This section examines differences between the AzAMI participants and the comparison group on academic behavior during the study period, from Fall 2014 to Spring 2017. Exhibits 6.2 through 6.6 show the average number of credit hours earned, average GPA, course load in most recent semester, enrollment persistence, and time taken to earn a certificate of completion or degree.

Exhibit 6.2 presents the credit hours earned in AzAMI and MCC courses. In total, AzAMI participants earned more credit hours on average than the comparison group, 24 versus 21 credits, respectively. AzAMI participants earned 19 AzAMI credit hours and 5 MCC (non-AzAMI course) credit hours, on average. The comparison group earned 6 AzAMI credit hours on average and 15 MCC (non-AzAMI course) credit hours on average.<sup>42</sup> In addition to earning more credits, Exhibit 6.3 shows that the participant group had a higher average GPA at MCC than the comparison group (3.27 versus 3.19 GPA, respectively).

**Exhibit 6.2: Number of Credit Hours Earned**



**Exhibit 6.3: Average GPA at MCC**



Statistical significance: \*\*\* = at the 1% level, \*\* = at the 5% level, \* = at the 10% level.

Note: As of July 2017. For Exhibit 6.2, N=463 for the participant group and N=941 for the comparison group. For Exhibit 6.3, N=444 for the participant group and N=938 for the comparison group, excluding missing data.

<sup>42</sup> Full-time at MESA is defined as 12 credit hours per semester.



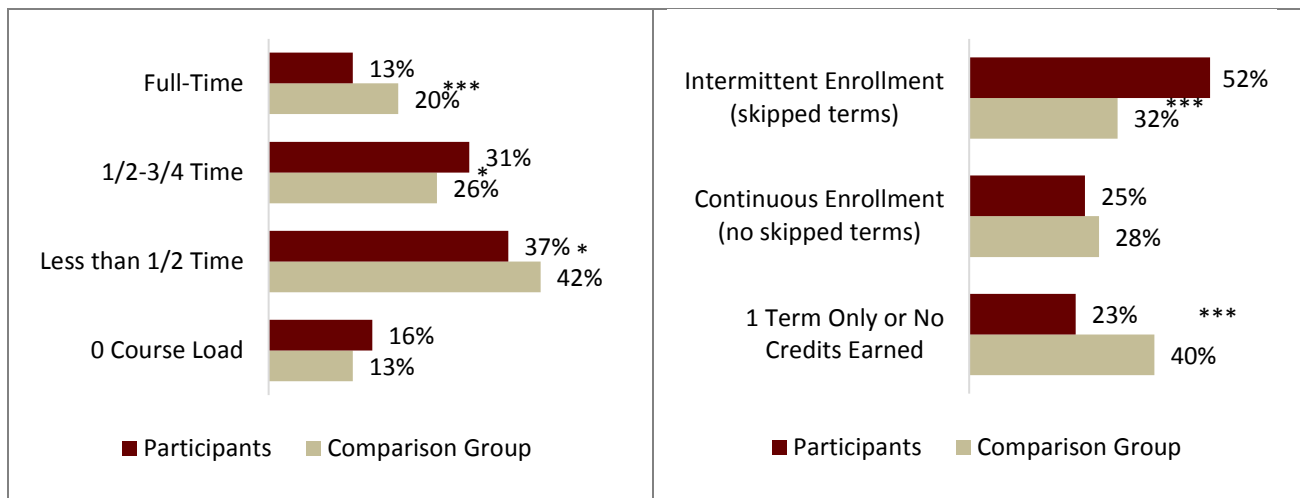
Exhibits 6.4 and 6.5 display the intensity at which the participant and comparison groups pursued their coursework. Exhibit 6.4 shows that most students in both the participant and comparison groups were not full-time students (12 credit hours per semester) in the most recent semester they enrolled. Rather, the largest share of students (about 40 percent of both groups) were less than half-time students (fewer than 6 credit hours) in their most recent semester at MCC.

Similarly, Exhibit 6.5 presents the enrollment persistence of students in consecutive semesters. Continuous enrollment, meaning no skipped semesters, was relatively rare for both groups. About one-quarter of the students in both groups were continuously enrolled and did not skip any semesters (including the summer semester). About half of the participant group was enrolled intermittently (skipped semesters). This proportion was lower for the comparison group, about one-third. Overall, the comparison group was less engaged at MCC than the participant group; 40 percent of the comparison group took courses for one semester or less, but only 23 percent of the participant group did.

Of the students who took courses intermittently, participants skipped an average of 1.7 semesters and the comparison group skipped an average of 1.6 semesters. No one in the participant or comparison group skipped more than 5 semester in total in the 8-semester study period.

**Exhibit 6.4: Course Load in Last Semester Enrolled**

**Exhibit 6.5: Enrollment Persistence**

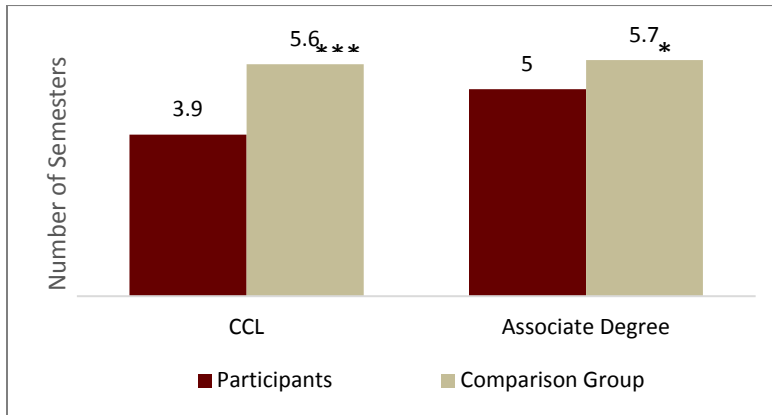


Statistical significance: \*\*\* = at the 1% level, \*\* = at the 5% level, \* = at the 10% level.

Note: As of July 2017. N=463 for the participant group and N=941 for the comparison group.

Finally, Exhibit 6.6 displays the time to earn a certificate of completion (CCL) or associate degree for the participant and comparison groups. Time is measured as the number of semesters, starting with the first term in which the student earned credit hours. This figure includes only students who earned a CCL or associate degree at MCC, in the AzAMI program or in other departments. AzAMI students earned CCLs about 1.5 semesters faster, on average, than the comparison group. Similarly, AzAMI students earned associate degree at a slightly faster rate (0.7 semester faster) than the comparison group, 5.0 semesters versus 5.7 semesters, respectively, though this difference was significant only at the 10 percent level.

**Exhibit 6.6: Time to Earn CCL or Associate Degree**



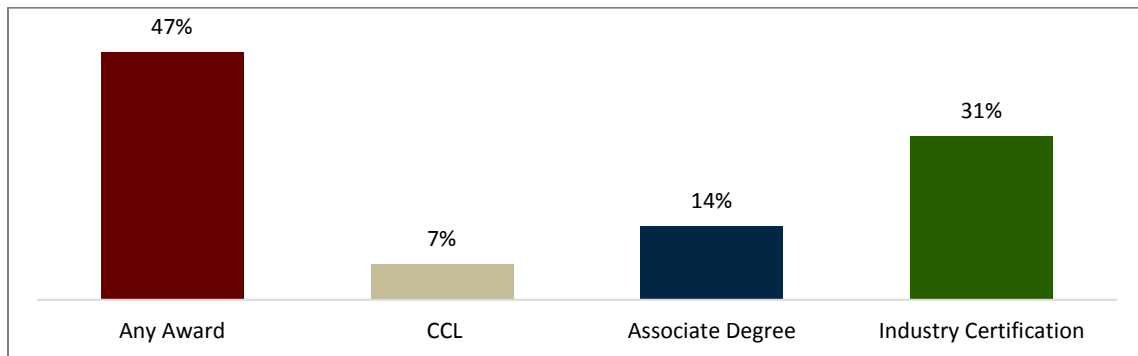
Statistical significance: \*\*\* = 1% level, \*\* = 5% level, \* = 10% level.  
Note: As of July 2017. Sample size - participant group: N=31 for CCL, N=70 for associate degree; comparison group: N=26 for CCL, N=35 for associate degree.

### 6.3 Awards Earned by the Participant and Comparison Groups

This section reports the number of awards and the various categories of awards earned by AzAMI participants and comparison group students in the study period. Exhibits 6.7 and 6.8 focus solely on the awards earned by AzAMI students, while Exhibit 6.9 compares the awards earned across the two groups by type of award.

Exhibit 6.7 displays the AzAMI awards earned by the participant group as of July 2017. The category “any AzAMI award” includes all the award types presented in the exhibit. Almost half (47 percent) of the participant group earned some kind of AzAMI award. The most frequent types of award were industry certifications, followed by associate degrees, and certificates of completion (CCLs).

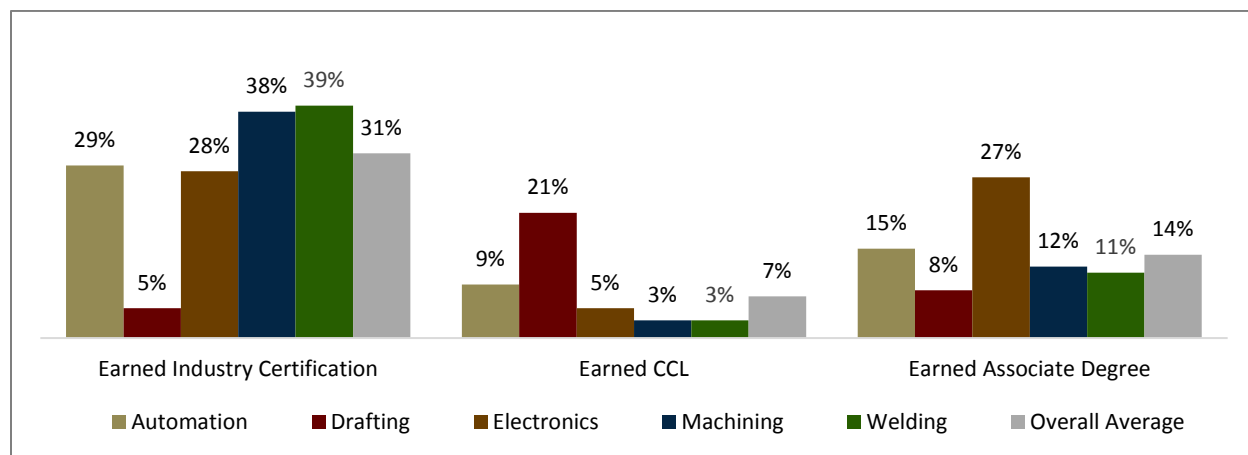
**Exhibit 6.7: AzAMI Awards Earned**



Note: As of July 2017. Each award category is calculated with a denominator of 463 students. Students who earned multiple award types, such as an industry certificate and a CCL, are represented only once in the “Any AzAMI Award” category.

Exhibit 6.8 depicts the AzAMI awards earned by program of study for the participant group. The data show the degree of popularity of the various types of awards in different programs. For example, only 5 percent of students in the drafting program earned an industry certificate, compared to 39 percent of welding students and the overall average of 31 percent. In contrast, 21 percent of students in the drafting program earned CCLs, which is three times the overall average of 7 percent. Finally, students in the electronics program earned associate degrees at the highest rates: 27 percent compared to an overall average of 14 percent. Industry trends may explain some of this variation. It is likely that different types of industry and academic degrees are in demand across occupations. It is also possible that certain degrees or certificates are not offered by AzAMI. For instance, the drafting program did not have any embedded industry certificates. In addition, AzAMI boot camp courses are industry-specific, and all students who completed a boot camp course earned an industry certificate. Nearly all boot camp participants were in the automation and electronics programs.

**Exhibit 6.8: AzAMI Program Awards Earned by Program of Study**



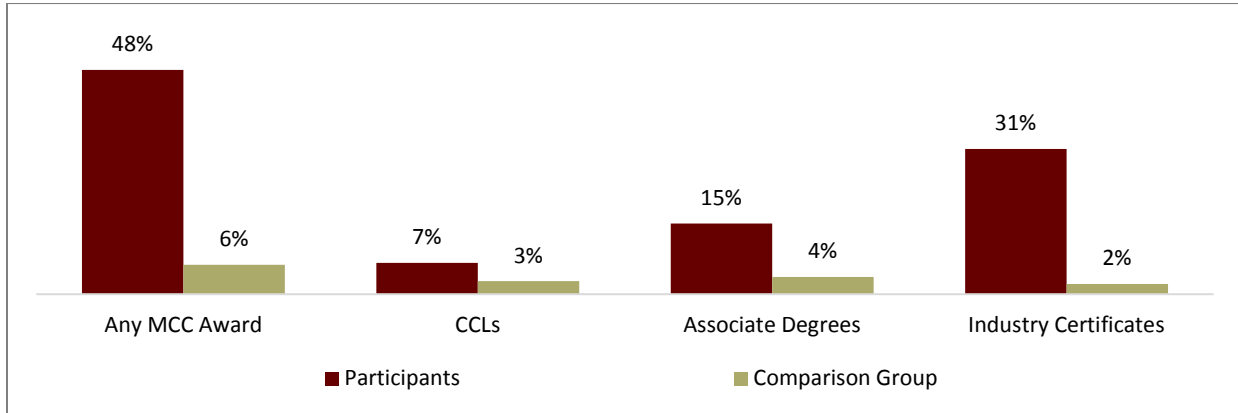
Note: As of July 2017. N=463.

Exhibit 6.9 compares the MCC awards earned by the participant group with those earned by the comparison group.<sup>43</sup> Overall, 48 percent of AzAMI students and 6 percent of the comparison group students earned an award. These awards include CCLs, associate degrees, and industry certificates.

It should be noted that the industry certificate award category in the AzAMI program is not directly comparable with the comparison group. The only industry certificates available for the comparison group were manufacturing certificates offered by the AzAMI department; no industry certificates were offered in other departments. This explains why only 2 percent of comparison group individuals earned an industry certificate.

<sup>43</sup> A small number of AzAMI students (8 students) earned associate degrees at MCC in other departments, which is why the associate degree rates for AzAMI students are slightly higher in Exhibit 6.9 compared with Exhibit 6.7. For example, 14 percent of AzAMI students earned an associate degree through the AzAMI program, and 15 percent of AzAMI students earned any kind of associate degree at MCC, which includes associate degrees earned through the AzAMI program and associate degrees in other MCC departments.

**Exhibit 6.9: All Awards Earned from MCC**



*Note:* As of July 2017. Each award category is calculated with a denominator of 463 students in the participant group and 941 students in the comparison group. If a student earned multiple award types, such as an industry certificate and a CCL, the student is represented only once in the “Any MCC Award” category. N=463 participant group, N=941 comparison group

## 6.4 Multivariate Regression Analysis

Finally, we conducted a multiple regression analysis to examine the association between the baseline demographic characteristics and the outcome variables for the participant and comparison groups. Measured outcomes included:

- Likelihood of earning either an associate degree or CCL (model 1)
- Likelihood of earning an associate degree (model 2)
- Likelihood of earning a CCL (model 3)
- Likelihood of completing the desired course of study, or earning any MCC award (model 4).

We ran separate linear probability models for each outcome. Linear probability regression models assess the probability of achieving an outcome after controlling for the explanatory variables that include baseline demographic characteristics. The key independent variable of interest is the “treatment group” variable. The treatment group variable is equal to 1 if the observation represents an individual in the participant group and is equal to 0 if the observation represents an individual in the comparison group.

We included demographic variables such as gender, age, race, ethnicity, receipt of high school diploma, Pell grant receipt, and first language, as controls to account for differences between the participant and comparison groups at baseline. We also included interactions between the treatment group variable and the baseline demographic variables to capture the differential association of the treatment and comparison groups with several demographic characteristics on the outcomes. For example, male AzAMI participants might be more likely to win an award and complete the program compared to female AzAMI participants.

Besides the demographic controls, we also controlled for academic behavior using the variable number of semesters, which is the number of terms in which a student earned credits at MCC since Fall 2014 (ranging from 0 to 8). This variable may account for an individual’s persistence and motivation to complete the program of study and achieve an award. If the AzAMI program is targeting students who are more motivated, then AzAMI students may be achieving better educational outcomes due not only to the benefits imparted by the program alone, but also to individual motivation.

The dependent variables in models 1–4 are specified as follows. In model 1, the dependent variable is equal to 1 if the student completed either a CCL or an associate degree at MCC and equal to 0 if the student did not complete either award. In model 2, the dependent variable is equal to 1 if the student earned an associate degree at MCC and equal to 0 if the student did not. Similarly, in model 3, the dependent variable is equal to 1 if the student completed a CCL at MCC and equal to 0 if the student did not.<sup>44</sup>

Finally, the dependent variable in model 4 is an indicator variable that is equal to 1 if the student completed “Any MCC award” (or any award completion) and is equal to 0 if the student did not complete any MCC award. Completers in model 4 could earn an associate degree, CCL, or industry certificate.<sup>45</sup> It is important to note that the “Any MCC Award” variable includes industry certificates earned by the comparison and participant groups only in manufacturing (within AzAMI), rather than a wider set of industry certificates in other disciplines.

Exhibit 6.10 presents the key regression results for models 1–4 that include the treatment group variable and the model’s demographic controls.

**Exhibit 6.10. Regression Results from the Linear Probability Models for Earned Awards**

Dependent Variable: Earned MCC Award				
Mean of Dependent Variable	9.4%	7.5%	4.1%	20.0%
	Model 1	Model 2	Model 3	Model 4
Independent Variables	Associate Degree or CCL	Associate Degree	CCL	Any MCC Award
<b>Treatment group</b>	0.156** (0.074)	0.036 (0.067)	0.110** (0.054)	0.304*** (0.091)
<b>Male</b>	-0.007 (0.031)	0.003 (0.028)	-0.015 (0.022)	0.004 (0.038)
<b>Age 26-35</b>	-0.006 (0.024)	-0.013 (0.022)	-0.005 (0.018)	0.026 (0.030)
<b>Age 36-45</b>	-0.018 (0.038)	-0.019 (0.035)	-0.018 (0.028)	-0.015 (0.047)
<b>Age 46+</b>	-0.004	-0.013	-0.006	-0.017

<sup>44</sup> Industry certificates are not included as a separate outcome because they are limited to manufacturing certificates. For this reason, there is no good comparison group available.

<sup>45</sup> The award may have been earned through AzAMI or in an MCC academic department.

Dependent Variable: Earned MCC Award				
Mean of Dependent Variable	9.4%	7.5%	4.1%	20.0%
	Model 1	Model 2	Model 3	Model 4
Independent Variables	Associate Degree or CCL	Associate Degree	CCL	Any MCC Award
	(0.032)	(0.029)	(0.023)	(0.040)
<b>Hispanic</b>	-0.001	-0.001	-0.003	0.024
	(0.031)	(0.028)	(0.022)	(0.038)
<b>Black</b>	-0.007	-0.003	0.008	-0.029
	(0.053)	(0.049)	(0.039)	(0.066)
<b>Asian</b>	0.002	-0.002	0.013	0.015
	(0.051)	(0.047)	(0.037)	(0.063)
<b>Other Race</b>	-0.022	-0.018	-0.009	-0.022
	(0.040)	(0.036)	(0.029)	(0.049)
<b>GED Education</b>	-0.008	-0.006	0.002	0.030
	(0.037)	(0.033)	(0.027)	(0.045)
<b>Home-Taught Education</b>	-0.029	-0.029	-0.018	-0.039
	(0.160)	(0.145)	(0.115)	(0.196)
<b>Pell Grant Received</b>	-0.013	-0.008	-0.019	-0.045
	(0.023)	(0.021)	(0.017)	(0.028)
<b>First Language is Not English</b>	-0.059	-0.060	-0.029	-0.046
	(0.045)	(0.040)	(0.032)	(0.055)
<b>First Language is Missing</b>	-0.047**	-0.042**	-0.027*	-0.029
	(0.021)	(0.019)	(0.015)	(0.026)
<b>U.S. Citizen</b>	0.002	-0.016	0.010	0.087*
	(0.037)	(0.034)	(0.027)	(0.046)
<b>Treatment * Male Gender</b>	-0.055	0.010	-0.050	-0.106
	(0.061)	(0.055)	(0.044)	(0.075)
<b>Treatment * Age 26-35</b>	-0.017	0.003	0.002	0.048
	(0.041)	(0.038)	(0.030)	(0.051)
<b>Treatment * Age 36-45</b>	-0.012	0.020	-0.023	0.077
	(0.056)	(0.051)	(0.040)	(0.069)
<b>Treatment * Age 46+</b>	0.030	0.030	0.029	0.061
	(0.056)	(0.051)	(0.041)	(0.069)
<b>Treatment * Hispanic</b>	-0.007	-0.004	0.007	-0.082
	(0.050)	(0.045)	(0.036)	(0.062)
<b>Treatment * Black</b>	0.221**	0.173*	0.027	-0.020
	(0.105)	(0.095)	(0.076)	(0.129)
<b>Treatment * Asian</b>	0.016	0.023	-0.023	-0.063
	(0.090)	(0.082)	(0.065)	(0.111)
<b>Treatment * Other Race</b>	0.001	-0.040	0.068	0.074
	(0.065)	(0.059)	(0.047)	(0.080)
<b>Treatment * GED Education</b>	-0.015	-0.000	-0.009	-0.152**

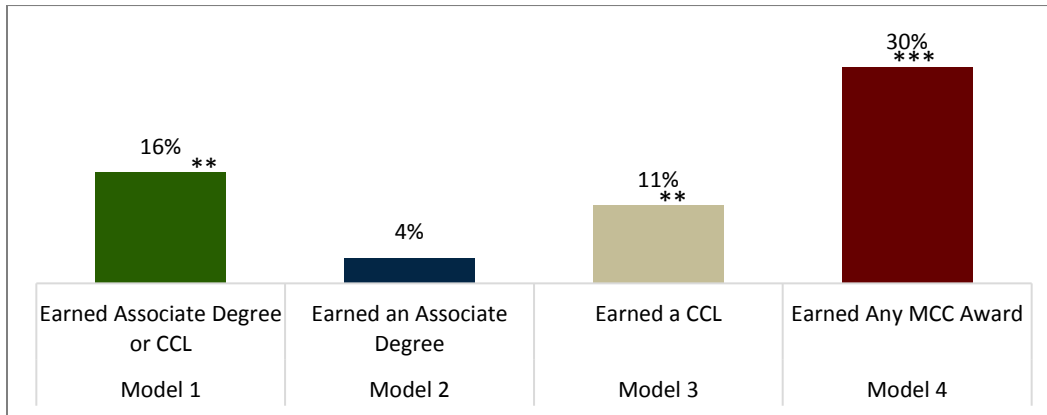
Dependent Variable: Earned MCC Award				
Mean of Dependent Variable	9.4%	7.5%	4.1%	20.0%
	Model 1	Model 2	Model 3	Model 4
Independent Variables	Associate Degree or CCL	Associate Degree	CCL	Any MCC Award
	(0.056)	(0.051)	(0.041)	(0.069)
<b>Treatment * Home-Taught Education</b>	0.365*	0.422**	0.205	0.626**
	(0.212)	(0.193)	(0.153)	(0.261)
<b>Treatment * Pell Grant Received</b>	-0.032	-0.011	-0.013	-0.020
	(0.038)	(0.035)	(0.028)	(0.047)
<b>Treatment * First Language is Not English</b>	-0.022	-0.017	-0.000	0.064
	(0.071)	(0.065)	(0.051)	(0.088)
<b>Treatment * First Language is Missing</b>	-0.081**	-0.076**	0.004	0.062
	(0.039)	(0.035)	(0.028)	(0.048)
<b>Number of Semesters with Credit Hours at MCC Since Fall 2014</b>	0.029***	0.028***	0.018***	0.031***
	(0.006)	(0.006)	(0.004)	(0.008)
<b>Treatment * Number of Semesters with Credit Hours at MCC Since Fall 2014</b>	0.028***	0.023**	-0.010	0.042***
	(0.010)	(0.010)	(0.008)	(0.013)
<b>_cons</b>	0.005	0.012	0.008	-0.080
	(0.054)	(0.049)	(0.039)	(0.067)
<b>R<sup>2</sup></b>	0.18	0.15	0.05	0.29
<b>Observations</b>	<b>1,186</b>	<b>1,186</b>	<b>1,186</b>	<b>1,186</b>

Statistical significance: \*\*\* = at the 1% level, \*\* = at the 5% level, \* = at the 10% level.

Note: The reference category for male is “female”; for age is “18-25 age group”; for race is “white”; for education is having a “high school diploma”; for Pell grant is “no Pell grant receipt”; for first language is “English”; and for U.S. citizen is “non-citizen.” Standard errors are reported in parentheses under each coefficient.

The key coefficient of interest for models 1–4 is the “treatment group,” displayed graphically in Exhibit 6.11. The coefficients on the treatment group variable reflect the likelihood of an individual in the treatment group earning an award, compared to an individual in the comparison group, all else held equal. For example, for model 1, the treatment group coefficient is 0.16. This result implies that an individual in the treatment group (AzAMI participants) is 16 percentage points more likely to earn an associate degree or CCL award, relative to an individual in the comparison group, all else held equal (significant at the 5 percent level).

**Exhibit 6.11: Regression Coefficients for “Treatment Group” Variable**



Note: Statistical significance: \*\*\*= at the 1% level, \*\*= at the 5% level, \*= at the 10% level.

Similarly, the results displayed in Exhibits 6.10 and 6.11 show that students in the participant group are not any more likely to earn an associate degree than students in the comparison group, all else held equal (model 2). For CCLs (model 3), those in the treatment group are 11 percentage points significantly more likely to earn a CCL. Finally, model 4 shows that those in the participant group are 30 percentage points more likely than those in the comparison group to complete a program and earn an MCC award. The coefficient of model 4 is also highly significant, at the 1 percent level.

The baseline demographic variables are not associated with the likelihood of earning an award in models 1 and 2, with the exception of first language and U.S. citizenship. In models 1, 2, and 3, having a missing value for the application question about first language is negatively associated with earning an award. As shown above in Exhibit 6.1, 30 percent of the participant group and 48 percent of the comparison group have a missing value on first language in the data. This suggests the presence of systematic bias in completing individual awards (associate degrees, CCLs, and industry certificates) among those who did not mention their first language. One reason may be that those individuals whose first language was not English, felt intimidated and therefore discouraged about completing the required coursework. In addition, U.S. citizenship is positively associated with earning any MCC award in model 4, although only at the 10 percent significance level.

The results show a few statistically significant interactions between the treatment indicator and the baseline demographic variables. The interaction effects test the hypothesis that the relationship between treatment group status and the outcome variable vary by demographic characteristics. In models 1 and 2, treatment group status (being in the treatment group rather than the comparison group) had a stronger positive association with the outcome for those who identified as black compared to those who identified as white (significant at the 5 percent level in model 1, and the 10 percent level in model 2). Treatment status also had a stronger positive association with the outcome for those who were home-taught versus those who received a high school diploma (significant at the 10 percent level in model 1 and the 5 percent level in models 2 and 4). On the other hand, treatment status had a negative association with the outcome for



those who received a GED diploma rather than a high school diploma (significant at the 1 percent level) in model 4.

In addition, there are statistically significant coefficients on the academic behavior variable (Number of semesters with credit hours at MCC since Fall 2014) across all models. As mentioned above, the academic behavior variable serves as a proxy for students' motivation and commitment to their academic program. We found that the number of semester in which a student earned credits at MCC is positively associated with the outcome variable across all four models (significant at the 1 percent level). Specifically, for a one-unit change in the number of semesters with MCC earned credit hours, the likelihood of achieving the outcome increased by 2 to 3 percentage points (on average across treatment and comparison groups), depending on the model.

Moreover, the interaction term between the treatment indicator and the academic behavior variable is statistically significant for models 1, 2, and 4, but not for model 3 (earning a CCL). The interaction term tests the hypothesis that the outcome (earning awards as defined by models 1–4) varies by academic behavior in the treatment group compared to the comparison group. We found that individuals in the treatment group with a higher number of semesters in which they earned credit hours at MCC were 2 to 4 percentage points more likely to earn an award in models 1, 2, and 4 relative to the comparison group.<sup>46</sup>

## 6.5 Conclusion

This chapter examined the differences in the treatment and comparison groups in demographic characteristics, academic behavior, and academic awards earned during the study period of Fall 2014 to Spring 2017. The regression analysis showed the association between awards earned and treatment status after controlling for several demographic characteristics and the number of semesters in which a student earned credits at MCC (a measure of academic behavior). As mentioned above, the evaluation did not provide causal estimates of the impact that the program had on educational outcomes.

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<sup>46</sup> Neither of the regression model specifications could control for the variation in the credit hours required for each student's intended award by award type. For example, there is variation in the credit hours required for an associate degree at MCC, by academic department. There is also dispersion in the credit hours required for a CCL at MCC. In general, the comparison group had the opportunity to earn associate degrees and CCLs at a faster rate than AzAMI students. Since our outcome metrics simply measure award attainment within the 8-semester period, student success in the comparison group may be partially due to selecting "easier" awards or award types that can be earned relatively quickly. For example, at MCC, several members of the comparison group earned associate degrees that required fewer than 30 credit hours, such as in the Emergency Response and Operations, or Landscape Horticulture departments. However, all AzAMI associate degrees require over 60 credit hours. Similarly, some members of the comparison group earned CCLs that required fewer than 15 credit hours such as Linux Professional and Adobe Foundations, while nearly all AzAMI CCLs required over 15 credit hours. The results presented here are therefore an underrepresentation of the association between treatment and awards earned in Models 1–4.

The treatment group included all students who participated in the AzAMI program during the grant period of performance. The comparison group was created from among all students at MCC who were not considered AzAMI participants. For this study, we constructed a comparison group of 941 students from MCC that reflected education, age and enrollment timeframe characteristics similar to those of the AzAMI participant group. We further limited the comparison group to include only those individuals who took at least one AzAMI course. The last criterion was imposed to ensure that comparison group students were looking for career choices similar to those of AzAMI participants.

Demographically, the comparison group had a higher proportion of females (13 percent vs. 7 percent in the treatment group) and younger individuals ages 18–25 (54 percent vs. 38 percent in the treatment group), and a lower proportion of Hispanics (14 percent vs. 19 percent in the treatment group). In addition, 90 percent of the comparison group had a high school diploma as did 81 percent of the treatment group.

Among the variables measuring academic behavior, the comparison group demonstrated a lower level of academic commitment and motivation. For example, the comparison group earned fewer credit hours on average at MCC (21 vs. 24 in the participant group) and maintained a lower average GPA (3.19 vs. 3.27 in the participant group). Also, 40 percent of the comparison group took courses for one semester or less compared to 23 percent for the participant group.

Finally, we constructed four regression models to estimate the likelihood of earning different types of academic award at MCC. The key coefficient of interest for each of these models was the treatment group status. Three of the four regression models (models 1, 3, and 4) had a statistically significant positive correlation with the outcomes measured i.e. we find that students in the AzAMI program were more likely to complete their program and earn an award. Compared to the comparison group, AzAMI students were 16 percent more likely to earn an associate degree or CCL, 11 percent more likely to earn a CCL, and 30 percent more likely to earn any MCC award (associate degree, CCL or industry certificate).

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## 7. SUMMARY AND IMPLICATIONS

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This chapter briefly summarizes the findings of the evaluation of the AzAMI program and discusses the implications of the findings. The discussion is intended to aid in the planning and implementation of similar grant programs in the future.

### 7.1 Study Findings

#### 7.1.1 Implementation Study Findings

The implementation study findings demonstrate that the AzAMI program is being implemented by a strong team of MCC faculty and staff in collaboration with a growing network of education and training providers, employers, and community stakeholders. The AzAMI program is providing education and training in aerospace and advanced manufacturing through traditional classroom and laboratory instruction as well as in boot camps that provide short-term training to prepare students to meet industry skill needs. In addition, the career navigator provides academic support services to students to help them enroll and succeed in the newly enhanced and expanded AzAMI courses and programs of study. The career navigator also offers job placement services as well as follows-up with students once they find employment. AzAMI staff are continuing their efforts to expand and strengthen relations with program stakeholders, including workforce development representatives, local education and training providers, and employers.

MCC has achieved many of its goals for the AzAMI program by successfully leveraging highly qualified program faculty and staff to improve course offerings and strengthen student support, developing and implementing boot camps, and conducting extensive program outreach to foster and build relationships with industry and other program stakeholders. In addition, AzAMI developed a sustainability plan to maintain the most successful components of the program going forward. The program's strong relationships with industry and stakeholders will help ensure the sustainability of the program.

As with all new programs, challenges with implementation were encountered, but AzAMI program staff have shown steady progress in addressing these challenges. For example, students noted frustration with the inability to earn college credit toward their program of study through boot camps. AzAMI modified the program so that boot camp participants could earn credit toward their program of study through prior learning credits. Another challenge, reported by program faculty and staff, was that in some cases it was difficult to accurately gauge employer demand for specific skill sets during the short start-up phase of the grant, though real-time adjustments were made to program plans to account for any miscalculations.

#### 7.1.2 Student Characteristics and Outcome Study Findings

Descriptive program data on AzAMI program characteristics indicate that the program has matured over time. For example, students have increased their use of career navigator services

in the later program years (from an average of 8 visits in grant year 2 to an average of 14 visits in grant year 3). In addition, over the course of the grant period, the program enrolled more students from the larger Mesa community, rather than just from the pool of current and former MCC students.

Moreover, AzAMI students who completed the program displayed different academic behavior than those who exited. For example, completers met with the career navigator more than twice as often as exiters and earned on average over twice as many credit hours in AzAMI courses. Over half of exiters quit the AzAMI program after completing only one semester or less in AzAMI courses. This indicates that the experience of the first term is critical in a student's pathway.

Pre-participants showed even less attachment to the AzAMI program than exiters. Pre-participants earned the lowest number of credit hours at AzAMI, and none used career navigator services in a systematic manner.

The outcomes study used regression modeling to compare educational outcomes between the AzAMI participants (the treatment group) and a comparison group composed of other, similar MCC students. The comparison group was constructed to be similar in education, age, enrollment timeframe, and career interests to the participant group. In three of four regression models, the evaluation team found that students in the AzAMI program were more likely to complete their program and earn an award than the students in the comparison group. Relative to the comparison group, AzAMI students were 16 percent more likely to earn an associate degree or certificate of completion (CCL), 11 percent more likely to earn a CCL, and 30 percent more likely to complete their desired course of study or earn any MCC award (associate degree, CCL or industry certificate). Each of these results was statistically significant at the 5 percent level at a minimum.

## 7.2 Study Implications

The implications of the study findings are as follows:

- **AzAMI met and exceeded its target participation and completion rates.** AzAMI staff exceeded the specific recruitment and outcome goals laid out in the MCC TAACCCT grant application. Of note, AzAMI served a total of 463 participants, about 60 percent more than the goal of 290. A total of 218 participants completed a TAACCCT program of study, completed credit hours, and earned credentials—12 more than the target for each goal (206).
- **The first term at AzAMI is critical in determining a student's pathway.** Over half of AzAMI program exiters left after completing only one semester or less of AzAMI coursework. Early exit may be an appropriate trend if students find the program to be a poor fit to their career aspirations or lifestyle. However, this trend also highlights the importance of ensuring that new students have the appropriate expectations and addressing any barriers to success from the start.

- **Program partnerships with community stakeholders are key to success.** From the start of the grant program, AzAMI staff were proactive in building partnerships with community stakeholders including employers, industry groups, economic development organizations, workforce development agencies, and other education/training providers. These partnerships were key to the program's success during the grant period and will be essential in ensuring the program's sustainability. As in the AzAMI program, future program implementers should use a wide range of engagement methods to develop strong partnerships with community stakeholders.
- **A strong team of staff who are well versed in building lasting relationships with community stakeholders is needed.** A small but strong, well-qualified group of program staff was very successful in implementing this grant program, especially in building fruitful relationships with community stakeholders including employers, industry groups, economic development organizations, and other community colleges. Their success points to the necessity of having grant staff in place that are skilled and experienced in building strong relationships with community stakeholders from the start of the grant.
- **Course availability/scheduling can be challenging when expanding a program.** Some AzAMI students expressed frustration with the limited availability of advanced courses during the semesters in which they needed to take them. Expanding recruitment efforts for academic programming will most likely increase student demand for the courses associated with the program. In addition, if a program is growing, there may not initially be sufficient student demand for more advanced classes every semester because the new students have not had time to progress far enough into the program. Program implementers should expect such issues when expanding their program offerings and take early steps to mitigate them. Increasing the number of entry-level classes offered each semester will help to meet the needs of new students, and coordinating the plans of study for more advanced students when they need to take specific classes may help to address this challenge.
- **Commitment to supporting student success through individualized support adds value.** The career navigator was key to engaging students interested in the AzAMI program, helping new students enroll, and ensuring that students' needs were met while they were in the program. This reliable and individualized support was noted by participants as essential in helping them navigate the program successfully. Future program implementers should consider how they can offer similar program services to both engage new participants and support existing participants.
- **Short-term training options offer students the skills they need to find work and meet the skill needs of employers.** The boot camps developed by AzAMI in collaboration with local employers should be viewed as a successful model for quickly upskilling and providing certificates to program participants with existing experience to meet the skill demands of employers. Offering college credit for boot camp participation was an important improvement to this short-term training option that will likely keep boot camp participants engaged in the AzAMI program and contribute to the sustainability of the program.

- **Implementing the program with the support and buy-in of the operating institution is essential.** AzAMI program management reported that the support and buy-in of MCC was essential in implementing the program successfully. This support strengthened the program’s ability to build strong relationships with community stakeholders and leverage additional resources to help grow and sustain the program.
- **Piloting new online/software programs allows for adjustments to be made.** AzAMI experienced some challenges in using two new online tools: Tooling U and Viridis. Tooling U, an online learning tool, was fully implemented at the start of the grant program and despite challenges was continued. Viridis, a career pathways software program, was piloted, and when issues were identified, a new program was implemented. New software and/or online learning tools should be piloted before they are implemented program-wide. Program staff and students can provide useful feedback on the usability and functionality of such software programs, which should be used to inform decisions about whether to fully adopt the software/tool or identify alternative options.
- **Leveraging additional resources throughout the life of the grant helps support and expand grant activities and ensure sustainability.** AzAMI program staff were very successful in identifying outside sources of funding to help grow and sustain the program. One key to success was that they began identifying these outside resources early in the grant period rather than delaying this task to the end of the grant period. Grant staff in future programs should follow the lead of AzAMI and work to leverage additional grant resources throughout the grant period.

### 7.3 Study Limitations and Directions for Future Research

The evaluation team’s analysis could not capture various factors that may reflect unmeasured differences between the two groups. The findings of this correlational study point to a need for a more in-depth investigation to identify the precise, causal effects of the AzAMI program, on both educational and employment outcomes. The team was unable to evaluate the effect of the TAACCCT-funded AzAMI program on employment and earning outcomes because individual-level data on quarterly wages and employment could not be obtained from the Arizona Department of Economic Security, Unemployment Insurance Administration. Future research should consider obtaining data on labor market outcomes.

This outcome study shows a higher positive association between the AzAMI participants and earned awards relative to the comparison group. However, the positive association may be due to unmeasured differences between the individuals in the participant group and those in the comparison group. For instance, if the AzAMI participants were more motivated and committed than the comparison group members, then some or all of the positive association between the treatment group and educational outcomes may be due to these unmeasured characteristics. On the other hand, the positive association could also point to the program having a positive impact on educational outcomes. Due to the following limitations in the data, the “true” causal effect of the program could not be measured:

- **Lack of an appropriate comparison group due to the intensive intake process at AzAMI:** Rigorous evaluations require comparing actual and counterfactual outcomes, that is, comparing how the individual would have fared in the absence of the program or intervention. But since an individual can be identified in only one state at a point in time, it becomes crucial to identify a comparison group that is *observationally similar* to the treatment group.  
However, the participants in AzAMI were selected from among a group of pre-participants. Those who met the program’s stringent criteria showed continuous persistence towards program goals. A causal impact evaluation would require the comparison group to be chosen based on a similar criteria, or be able to meet such criteria. In absence of such a group that allows for a more “apples to apples” comparison, the evaluation team could not causally estimate program impacts.
- **Lack of sufficient data on demographic and socio-economic outcomes:** Some impact evaluation techniques, such as propensity score matching, require sufficient baseline demographic and socioeconomic characteristics to create a comparison group that closely resembles the treatment group. Lack of sufficient data on such characteristics can be a serious impediment to conducting such impact evaluations with any degree of certainty. In this study, while the evaluation team had access to a rich number of baseline characteristics, including employment and wage rate at the time of application, the baseline data on the comparison group were inadequate to produce more rigorous estimates.

Overall, the evaluation found that the AzAMI program has a strong team of MCC faculty and staff who work in collaboration with a growing network of education and training providers, employers, and community stakeholders. Together, the AzAMI program is successfully providing education, training, and career navigator services to participants. The program has been successful in meeting its goals pertaining to program implementation as well as participation and completion rates. In addition, AzAMI participants were more likely than their counterparts in the comparison group to earn an associate degree or certificates of completion. Finally, the AzAMI staff have been successful in securing additional funding to sustain the program going forward.

## APPENDICES

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## APPENDIX A. OVERVIEW OF AZAMI CERTIFICATES AND DEGREES



**AzAMI**  
Arizona Advanced  
Manufacturing Institute  
FINDING SOLUTIONS. CREATING OPPORTUNITIES.

# Competency-Based, Stackable Credentials

### ASSOCIATES IN APPLIED SCIENCE DEGREES - AAS

- AUTOMATION TECHNOLOGY
- CAM SYSTEMS PROGRAMMING
- CNC
- ELECTROMECHANICAL DRAFTING
- ELECTRONICS ENGINEERING TECHNOLOGY
- ELECTRONICS TECHNOLOGY
- MACHINING & PRODUCT DEVELOPMENT
- MANUFACTURING ENGINEERING TECHNOLOGY
- MANUFACTURING TECHNOLOGY
- MICRO CIRCUIT MASK DESIGN
- WELDING

### CERTIFICATES OF COMPLETION - CCL

- AUTOMATION TECHNOLOGY LEVEL I
- AUTOMATION TECHNOLOGY LEVEL II
- AUTOMATION TECHNOLOGY LEVEL III
- CAM SYSTEMS PROGRAMMING
- CNC MACHINING
- COMPUTER AIDED DRAFTING (CAD)
- ELECTROMECHANICAL DRAFTING
- ELECTRONICS TECHNOLOGY
- MACHINING I
- MECHANICAL DRAFTING
- WELDING

### FOUNDATION CURRICULUM

- MANUFACTURING FUNDAMENTALS  
Measurements, Materials & Safety  
Employability Skills
- NATIONAL CAREER READINESS  
CERTIFICATE (NCRC)  
Workforce Readiness

### INDUSTRY CERTIFICATION BOOTCAMPS

- COMPOSITES
- ELECTRICAL WIRING
- INDUSTRIAL AUTOMATION
- MECHANICAL ASSEMBLY

### NATIONAL INDUSTRY CERTIFICATIONS

- AMERICAN WELDING SOCIETY (AWS) –  
FMAW, GMAW, GTAW
- AUTOCAD
- IPC-A-620 ELECTRICAL
- IPC ELECTRONICS
- J-STANDARD SOLDERING
- NATIONAL INSTITUTE FOR  
METALWORKING SKILLS, (NIMS)  
LEVEL I, II
- OSHA – 10/30 SAFETY  
CERTIFICATION
- REGISTERED APPRENTICESHIP  
CERTIFICATES
- SOLIDWORKS ASSOCIATE
- SOLIDWORKS PROFESSIONAL

Email [AzAMI@mesacc.edu](mailto:AzAMI@mesacc.edu)  
Or visit us online at [mesacc.edu/azami](http://mesacc.edu/azami)

 [www.facebook.com/azami.mesacc](http://www.facebook.com/azami.mesacc)  
 [@azami\\_mesacc](https://twitter.com/azami_mesacc)

## APPENDIX B. CAREER NAVIGATOR FLYER



### Career Navigator Cesar Becerra

The Career Navigator is part of the AzAMI approach to meeting the needs of students enrolled in our core programs: Electronics, Drafting, Automation, Machining and Welding.

My role is to provide support services to help you set and achieve your academic and career goals.

Participants have the opportunity to:

Academic Advisement

Career Planning

Resume Assistance

Job Readiness Workshops

Internships and Job Placement

Job Fairs, Workshops and Events

Explore Funding Opportunities



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## Schedule your appointment today!



This project received 2.5 million dollars from a grant awarded under the Trade Adjustment Assistance Community College and Career Training (TAACCCT) grant, as implemented by the U.S. Department of Labor's Employment and Training Administration. The product was created by the grantee and does not necessarily reflect the official position of the U.S. Department of Labor. The U.S. Department of Labor makes no guarantees, warranties or assurances of any kind, expressed or implied, with respect to such information, including any information on linked sites and including but not limited to the accuracy of the information or its completeness, timeliness, usefulness, adequacy, and continued availability of ownership. The Maricopa County Community College District is an EEO/AA institution and an equal opportunity employer of protected veterans and individuals with disabilities. This is an equal opportunity employer / program, and auxiliary aids and services are available upon request to individuals with disabilities.



## APPENDIX C. AZAMI PROMOTIONAL FLYER



# AzAMI

## Arizona Advanced Manufacturing Institute

FINDING SOLUTIONS. CREATING OPPORTUNITIES.

MESA COMMUNITY COLLEGE

**A PREMIER ADVANCED MANUFACTURING LEARNING EXPERIENCE**

Arizona Advanced Manufacturing Institute (AzAMI) is a unique center of excellence created to help Arizona business and industry partners stay of excellence created to help Arizona business and industry partners stay competitive and to provide a pipeline of skilled, career educated and ready-to-work employees. AzAMI core programs include Automation, Machining, Electronics, Welding and Drafting, which includes Design in Additive Manufacturing technology.

**CUSTOMIZED SOLUTIONS FOR STUDENTS & EMPLOYERS**

From enrollment to employment, AzAMI connects workforce opportunities with local and regional businesses, building a technically trained, talent supply chain of motivated and skilled individuals. AzAMI provides industry certifications; stackable credentials that are competency based with degree and certificate programs; flexible models of delivery; and portable labs for on-site training. AzAMI creates a rich menu of innovative and customized services.

**PARTNERSHIPS**



# PROMO FLYER



**PARTNERSHIPS THAT PRODUCE RESULTS**

AzAMI brings manufacturing sector leaders to the table so that together we can create solutions that bridge education and workforce partnerships to better align technical development and workforce readiness skills, meeting the needs of industry.

**ACADEMIC DEGREES**

AzAMI academic degrees equip employees with technical, employability and academic skill sets that our industry partners and advisory boards have identified as critical to success. Many of our degrees transfer to bachelor's programs, encouraging students and employees to continue building stackable credentials in their education pathways.

**CERTIFICATES THAT VALIDATE SKILLS**

At AzAMI, we design responsive, flexible and on-site programs that build and strengthen the emerging technical skill sets of our students - your current and future employees - leading to portable, industry recognized, academic, stackable credentials and competency-based certifications.

**INDUSTRY CERTIFICATION BOOT CAMPS**

AzAMI has designed short-term, certification Boot Camps for skilled technicians with pre-assessed competencies to help them obtain the recognized industry credentials required in specific technical areas. These credit-bearing Boot Camps increase their employability with job-readiness certifications and the validation of skills and abilities required by many employees.

**INTERNSHIPS AND APPRENTICESHIPS TO EARN AS YOU LEARN**

Our industry partnerships offer hands-on learning opportunities for students through a variety of on-the-job training experiences through internships, job shadowing, mentoring, apprenticeships and career planning resources to recruit and educate the next generation of manufacturers.

**ADDITIVE MANUFACTURING PROCESSES**

AzAMI has developed the capacity to offer 3D printing processes with a certification in our drafting program. We focus on Fused Deposition Modeling. The FDM machines on campus mirror those used in industry with the capability to print using over 11 types of thermoplastics, including aerospace materials. MCC also has 3D scanning capabilities, which allow reverse engineering of existing parts as well as for Metrology (parts inspection and verification). For more information, contact Dirk Begell at [dirk.begell@mesacc.edu](mailto:dirk.begell@mesacc.edu).

email us at [AzAMI@mesacc.edu](mailto:AzAMI@mesacc.edu)  
or visit us online at [mesacc.edu/azami](http://mesacc.edu/azami)

facebook.com/azami.mesacc  
@azami\_mesacc

The project received 2.5 million dollars from a grant awarded under the Trade Adjustment Assistance Community College and Career Training (TAACCCT) grant, as administered by the U.S. Department of Labor's Employment and Training Administration. The product was developed by the grantee and does not necessarily reflect the official position of the U.S. Department of Labor. The U.S. Department of Labor makes no guarantee, warranty or assurance of any kind, expressed or implied, with respect to such information, including any information on third sites and linking that is not linked to the accuracy of the information or its completeness, timeliness, usefulness, and continued availability of materials.

A Mesa Community College The Mesa Community Colleges are EEO/AAA institutions. This is an equal opportunity employer/program, and auxiliary aids and services are available upon request to individuals with disabilities.

APPENDIX D: FLYER FOR AZAMI EMPLOYER RECRUITMENT EVENT



# Employers:

*Do you have job openings? Need to find the talent?*

**On-site Recruiting Opportunity**  
*Find your next employee at MCC*

## You Can Find Us:

1833 West Southern Avenue  
TC 50 Bldg.  
South End of Campus on Solar Way  
Mesa, AZ 85202

Email us at:  
[AzAMI@mesacc.edu](mailto:AzAMI@mesacc.edu)

Visit us online at:  
[mesacc.edu/azami](http://mesacc.edu/azami)

 /azami\_mesacc

 @azami\_mesacc

 **MARICOPA**  
COMMUNITY COLLEGES  
The Maricopa Community Colleges are EEO/AA Institutions

## INTERNSHIPS -or- For HIRE

### Skills & Abilities

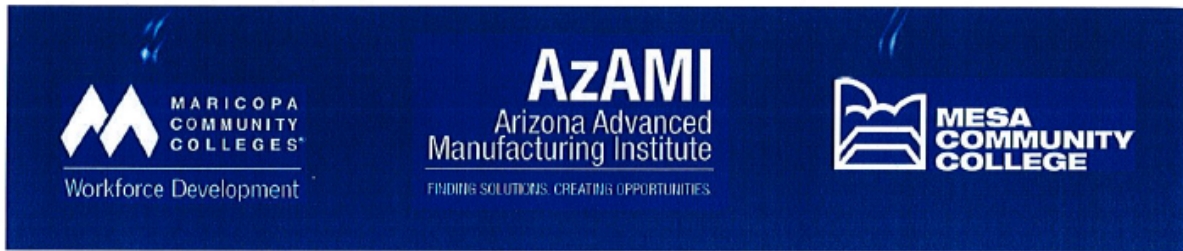
- Electrical/Mechanical Drafters
- Manufacturing Technicians
- Mechatronics Technicians
- Welding Technicians
- Additive Manufacturing Processors
- Automation & Robotic Technicians
- CNC Machinists
- Electrical Technicians

**CONTACT: Cesar Becerra, Career Navigator**  
**(480) 461-7216 | [cesar.becerra@mesacc.edu](mailto:cesar.becerra@mesacc.edu)**

## APPENDIX E. RUBRIC FOR EVALUATING "PARTICIPANT" STATUS

Name:	
MCC ID:	
Transcript Review (Grades, Persistence):	
Number of courses enrolled:	
Number of courses completed:	
Mandatory Populations:	
	Trade Adjustment Assistance
	Veteran
	Spouse or Dependent of Veteran
Preferred Populations:	
	Not Employed
	Underemployed
	Employed, but received Notice of Termination
Accuplacer Scores: Yes or No (if no, send to Testing Center)	
	Writing
	Reading
	Math
Technical Math Score: Yes or No (If no, advise)	
	Technical Math
	Technical Algebra
Program of Study: Declared or Not Declared (If not declared, establish Program of Study)	
	Automation
	Drafting
	Electronics
	Machining
	Welding
Evaluation Criteria for Enrollment: Check as appropriate	
	1. Student must be admitted to MCC and completed AzAMI intake form.
	2. Student is making academic progress towards program of study. (Persistence and retention)
	3. Number of credits accomplished vs. enrolled. (Minimum 75% successful completion in previous semester.)
	4. Student has identified training goals. (Student has declared program in SIS)
	5. Interested in pursuing industry recognized credential. (As stated on intake form.)
Notes: Students must have numbers 1-4 to be moved to Participant. Number 5 is encouraged.	
Recommended to moved to Participants: Y/N	
Ineligible: Y/N	

## APPENDIX F. AzAMI MANUFACTURING ADVISORY FORUM AGENDA



### *Manufacturing Advisory Forum Agenda*

Thursday, April 14, 2016

8:00am to 10:00am

Mesa Community College

MCC Library Reading Room, 3<sup>rd</sup> Floor, Room LB-300

1833 West Southern Avenue, Mesa, Arizona 85202

1. Breakfast Networking & Welcome.....Dr. Shouan Pan  
*President  
Mesa Community College*
2. Introduction of Members & Guests..... Leah Palmer  
*Executive Director  
Arizona Advanced Manufacturing Institute*
3. NIMS Certification.....Mark Lashinske  
*NIMS Board of Directors  
Award of Accreditation*
4. Skillful: Helping Employers Secure a Skilled Workforce.....Robert Khedouri  
*Managing Director & Chief Operating Officer  
Markle Foundation*
6. “Stand and Deliver”.....Student Success in the Pipeline  
*Maricopa Community College Talent*
7. Building partnerships that work.....Jen Jakemer  
*Human Resources Manager  
Boeing – Mesa, AZ*
8. Close with Invite to Tour the Labs..... Leah Palmer

*Join us for a tour of AzAMI Labs & Program*

**10:15 am TC 50 Building (golf carts available and within walking distance)**

## APPENDIX G: AZAMI PARTNERSHIPS

# AZAMI PARTNERSHIPS

### Key Employers



### Education



### Industry Organizations



### Government & Non-Profit Organizations





## APPENDIX H: DEMOGRAPHICS OF AZAMI PARTICIPANTS AND PRE-PARTICIPANTS

Characteristic	Participant Group (N=463)	Pre-Participants (N=85)
<b>Gender</b>		
Males	92%	87%
Females	7%	12%
<i>Missing</i>	<1%	1%
<b>Age</b>		
18-25 Years	38%	35%
26-35 Years	31%	38%
36-45 Years	17%	12%
46+ Years	13%	13%
<i>Missing</i>	1%	2%
<b>Race</b>		
White	59%	56%
Hispanic	19%	18%
Black	2%	0%
Asian	3%	1%
American Indian/Hawaiian/Other	8%	8%
<i>Missing</i>	9%	17%
<b>High School Graduation Status</b>		
High School Diploma	81%	68%
GED Certified	12%	13%
Home Taught	1%	1%
<i>Missing</i>	6%	18%
<b>First Language</b>		
English	62%	59%
Other than English	8%	9%
<i>Missing</i>	30%	32%
<b>Pell Recipient</b>		
Yes	34%	21%
No	64%	67%
<i>Missing</i>	3%	12%
<b>Citizenship</b>		
US Citizen	93%	85%
Non-Citizen (legal status)	4%	0%
<i>Missing</i>	3%	12%

Note: The High School Graduation status does not represent the student's highest educational attainment at baseline. Educational attainment data was unavailable for the comparison group.