Arizona Sun Corridor Get into Energy Consortium (ASC-GIEC)

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

Final Report

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EXECUTIVE SUMMARY

In 2012, DOL awarded a $13.5 million TAACCCT grant to support the Arizona Sun Corridor – Get Into Energy Consortium (ASC-GIEC) in expanding education and career training programs that target workers eligible for training under the Trade-Adjustment Assistance (TAA) program. The consortium includes five community colleges: Estrella Mountain Community College (EMCC), Chandler Gilbert Community College (CGCC), Pima Community College (PCC), Northland Pioneer College (NPC), and Yavapai College (YC).

The goal of the ASC-GIEC program is to facilitate high-skill, high-wage employment, and advancement in energy and mining. To do this, the ASC-GIEC initiative: (1) creates new credit-bearing foundational courses that bundle multiple industry-recognized credentials; (2) establishes energy and mining pathways; (3) develops industry-enforced common foundational curriculum and education requirements across consortium colleges; (4) develops a new agreement between consortium colleges and Arizona State University (ASU) to increase participation of trade-impacted workers and other adults in high-demand science, technology, engineering, and STEM (science, technology engineering, and math) fields; and (5) builds online and technology-enabled learning environments to increase education and training program access as well as accelerate progress for participants.

The evaluation of the ASC-GIEC program consists of two studies:

- *An implementation study* to examine all aspects of program implementation and successes in achieving its core strategies. This study relies on information collected through site visits, attendance at the consortium's quarterly meetings, program documentation, and participant surveys.
- *An outcomes study* to examine the educational outcomes of ASC-GIEC participants.[1] This study relies primarily on student record data from the consortium colleges.

Implementation Study

Implementation Study Design

The implementation study examines six broad topics related to the grant objectives:

- *Program Context* - How does the ASC-GIEC program address regional labor market needs?
- *Program Components and Service Delivery Strategy* - What are the key components of the ASC-GIEC program and how were they delivered?
- *Program Participation* - Who participated in the ASC-GIEC program and how were they recruited?
- *Partnerships* - What contributions did each partner make in: (1) program design; (2) curriculum development; (3) recruitment; (4) training; (5) placement; (6) program

[1] Because of limitations associated with the available wage data, we are unable to provide reliable estimates of labor market outcomes.

management, including providing ongoing advice and guidance; (7) leveraging of resources; and (8) commitment to program sustainability?

- *Program Management, Funding, and Sustainability* - What institutional management practices led to successful implementation of the project and allowed for the leveraging of other sources of project funding during and beyond the TAACCCT grant period?
- *Promising Practices and Lessons Learned* - What lessons can the field learn from ASC-GIEC program implementation?

To answer these research questions, the IMPAQ team used multiple data sources and analysis methods. Data sources included information collected through a web-based survey of ASC-GIEC participants, three rounds of site visits, a review of program documents, and IMPAQ team member attendance at five of the consortium's quarterly meetings.

Implementation Study Findings

Program Context: How does the ASC-GIEC program address regional labor market needs?

- While the consortium created a mechanism for predicting supply and demand, it was challenging to get timely and accurate hiring projections from industry partners.
- The consortium effectively responded to changing labor market demands by including additional industry partners.

Program Components and Service Delivery Strategy: What are the key components of the ASC-GIEC program and how were they delivered?

- Integration of core program curriculum and components varied across the consortium.
- Use of prior learning assessments was limited.
- Consortium colleges successfully incorporated relevant state-of-the-art tools, equipment, and technology into ASC-GIEC programs.
- Career Coaches were helpful in guiding students through program requirements and career preparation.

Program Participation: Who participated in the ASC-GIEC program and how were they recruited?

- The consortium successfully developed and implemented a comprehensive and unified marketing and recruiting plan during initial program implementation.
- Word of mouth and employer-initiated recruitment were particularly effective recruitment tools.
- The consortium had difficulties recruiting TAA-eligible workers and women.

Partnerships: What contributions did each of the partners make?

- Strong partnerships with industry and non-profit organizations were critical to curriculum development, equipment procurement, and recruiting; however, their efforts did not always translate into timely information sharing regarding hiring projections – making it difficult for the colleges to recognize, and therefore make adjustments, to the lower than expected number of job openings available to program completers.
- The strength of partnerships with local workforce organizations varied across colleges, which may have limited the recruitment of TAA-eligible and dislocated workers – the key target populations for TAACCCT grant programs.

Program Management, Funding, and Sustainability: What institutional management practices led to successful implementation of the project and allowed for sustainability?

- The strong partnerships that characterized the program facilitated effective management and collaboration.
- While consortium members expressed a desire to continue collaboration following the grant, it is unclear how many of these partnerships will be institutionalized.

Outcomes Study

Outcomes Study Design

The outcomes study addresses the following research questions:

- What are the demographic characteristics of ASC-GIEC study participants?
- Do ASC-GIEC study participants differ in their demographic characteristics from students enrolled in other career and technical education (CTE) programs in the consortium colleges, and from those of Arizona labor force participants generally?
- What were the educational outcomes of ASC-GIEC participants?
- What student characteristics are associated with desirable educational outcomes?
- How do the educational achievements of ASC-GIEC participants compare with those of the other CTE students?

We answered these questions using student data supplied by the colleges; transfer information from the National Student Clearinghouse (NSC); and the ASC-GIEC program intake form, which identifies students who were TAA-eligible at the time of program enrollment. Using these data, we conducted descriptive analyses of the characteristics of ASC-GIEC study participants, and regression analyses to assess whether observed educational outcomes varied based on individual characteristics and the college of enrollment.

Outcomes Study Findings

Participant Characteristics

- There were few female participants.

- With the exception of CGCC, consortium colleges recruited relatively few TAA-eligible individuals.
- Overall, ASC-GIEC participants were slightly more likely to be veterans than their counterparts in other CTE programs.
- ASC-GIEC study participants were more likely to be male, nonwhite, and less than 40 years old compared with those employed in similar industries across Arizona.

Educational Outcomes

- A substantial portion of ASC-GIEC participants did not take the program's foundational courses or complete the associated credentials. Male students and those not TAA-eligible were significantly more likely to take foundational courses and complete the credentials.
- TAA-eligible individuals were significantly less likely to complete the ASC-GIEC program than those who were not TAA-eligible.
- ASC-GIEC participants were significantly more likely than the other CTE students to complete their degree, but significantly less likely to transfer to a four-year institution.

Limitations to Interpreting the Findings

- Because it lacked a robust comparison group, the evaluation was unable to produce a quasi-experimental study that would provide evidence of the causal impact of the ASC-GIEC program. We instead compared the outcomes of program participants relative to the outcomes of students at the consortium colleges enrolled in CTE programs at the time of the grant.
- The evaluation was constrained by lack of available wage data, a common challenge among evaluations of TAACCCT programs. Without access to these data, we could not provide reliable analyses of employment outcomes.

Key Lessons Learned

- Throughout the grant period, hiring projections changed. This underscores the need for flexibility in recruitment and training among grantees generally, so they can be responsive to changing labor markets. It also highlights the need for colleges and industry partners to regularly share accurate information about hiring and graduation projections.
- Collaborations with industry partners allowed the consortium to ensure that students learned to use the equipment and tools found in energy facilities. Industry partners donated equipment, allowed students access to their facilities, and informed colleges' equipment procurement. Respondents across the ASC-GIEC participant population expressed the feeling that, because of the hands-on training they received, students were well prepared for energy-industry careers.
- Some components of the ASC-GIEC program, such as foundational courses and credentials, were not fully implemented. To address the underlying causes of

implementation issues such as this, a number of respondents suggested that a program planning year would have been helpful for setting guidelines, obtaining buy-in, and making necessary curriculum changes.

- TAACCCT programs should allocate time and funds for sustainability planning, not only for program elements, but also for the organizational mechanisms that support effective collaboration among industry, workforce development, and educational institutions.

1. INTRODUCTION

In January 2013, IMPAQ International, LLC, (IMPAQ) was awarded a contract by Estrella Mountain Community College (EMCC) to serve as the third-party evaluator of the *Arizona Sun Corridor – Get Into Energy Consortium* (ASC-GIEC) program, funded through the U.S. Department of Labor (DOL) Trade Adjustment Assistance Community College and Career Training (TAACCCT) grant program. The ASC-GIEC program, led by EMCC and implemented across five Arizona Sun Corridor community colleges, was designed to develop, improve, and expand adult educational pathways for careers in the energy and mining industries.

This Final Evaluation report presents findings related to the program's implementation and student outcomes throughout the program's entire evaluation period. The final evaluation of the ASC-GIEC program consists of two studies:

- *An implementation study* to examine all aspects of program implementation and successes in achieving its core strategies. This study relies on information collected through site visits, attendance at the consortium's quarterly meetings, program documentation, and participant surveys.
- *An outcomes study* to examine the educational outcomes of ASC-GIEC participants.[2] This study relies primarily on student record data from the consortium colleges.

The remainder of the report is organized as follows. Section 2 provides an overview of the ASC-GIEC program. Section 3 presents the findings of the implementation study. Section 4 presents the findings of the outcomes study, including descriptive analyses of the characteristics of program participants and outcomes of ASC-GIEC participants based on available data. Finally, Section 5 discusses our conclusions based on these findings.

[2] Because of limitations associated with the available wage data, we are unable to provide reliable estimates of labor market outcomes.

2. ASC-GIEC PROGRAM OVERVIEW

This section describes the context of the Arizona Sun Corridor as well as the program organization and structure.

2.1 Background

The Arizona Sun Corridor (ASC), which extends from the Mexican border to Phoenix, is one of 10 mega regions in the United States with populations projected to be more than nine million by 2040.[3] The ASC accounts for 80 percent of Arizona's total population and 88 percent of the state's economy. For the purposes of the ASC-GIEC grant, the ASC extends northward toward Las Vegas and includes the CanaMex Highway, a continuous trade route promoted by the North American Free Trade Agreement. As the population increases in this region, so does the demand for energy. However, energy providers in the region have projected a workforce crisis, with almost 55 percent of the workforce needing replacement in the next 10 years due to retirement and other attrition. The area's mining industry is projected to face a similar crisis.

In 2012, DOL awarded a $13.5 million TAACCCT grant to support the ASC-GIEC in expanding education and career training programs that target workers eligible for training under the Trade-Adjustment Assistance (TAA) program. The goal of the ASC-GIEC program, which is also open to other students, is to facilitate high-skill, high-wage employment, and advancement in energy and mining. The ASC-GIEC initiative represents a comprehensive and strategic approach to strengthening the ASC's talent pipeline to address the needs of the area's growing energy and mining industries. The centerpiece of this initiative is the industry-recognized ASC-GIEC competency model, which defines basic competencies (knowledge, skills, and abilities); industry fundamentals; industry technical competencies; and job-specific competencies in eight stackable tiers (discussed further in Section 3.3.2).

The ASC-GIEC consortium includes five community colleges: EMCC, Chandler Gilbert Community College (CGCC), Pima Community College (PCC), Northland Pioneer College (NPC), and Yavapai College (YC).

The program builds on an earlier effort by EMCC to engage industry partners in career pathways development through the Arizona Energy Workforce Consortium (AEWC). The ASC-GIEC initiative expands the earlier effort in five ways:

1. Creates new credit-bearing foundational courses that bundle multiple industry-recognized credentials.
2. Establishes energy and mining pathways.
3. Develops industry-enforced common foundational curriculum and education requirements across consortium colleges.

[3] http://www.doleta.gov/tradeact/TAPR_2011.cfm.

4. Develops a new agreement between consortium colleges and Arizona State University (ASU) to increase participation of trade-impacted workers and other adults in high-demand science, technology, engineering, and STEM (science, technology engineering, and math) fields.
5. Builds online and technology-enabled learning environments to increase education and training program access as well as accelerate progress for participants.

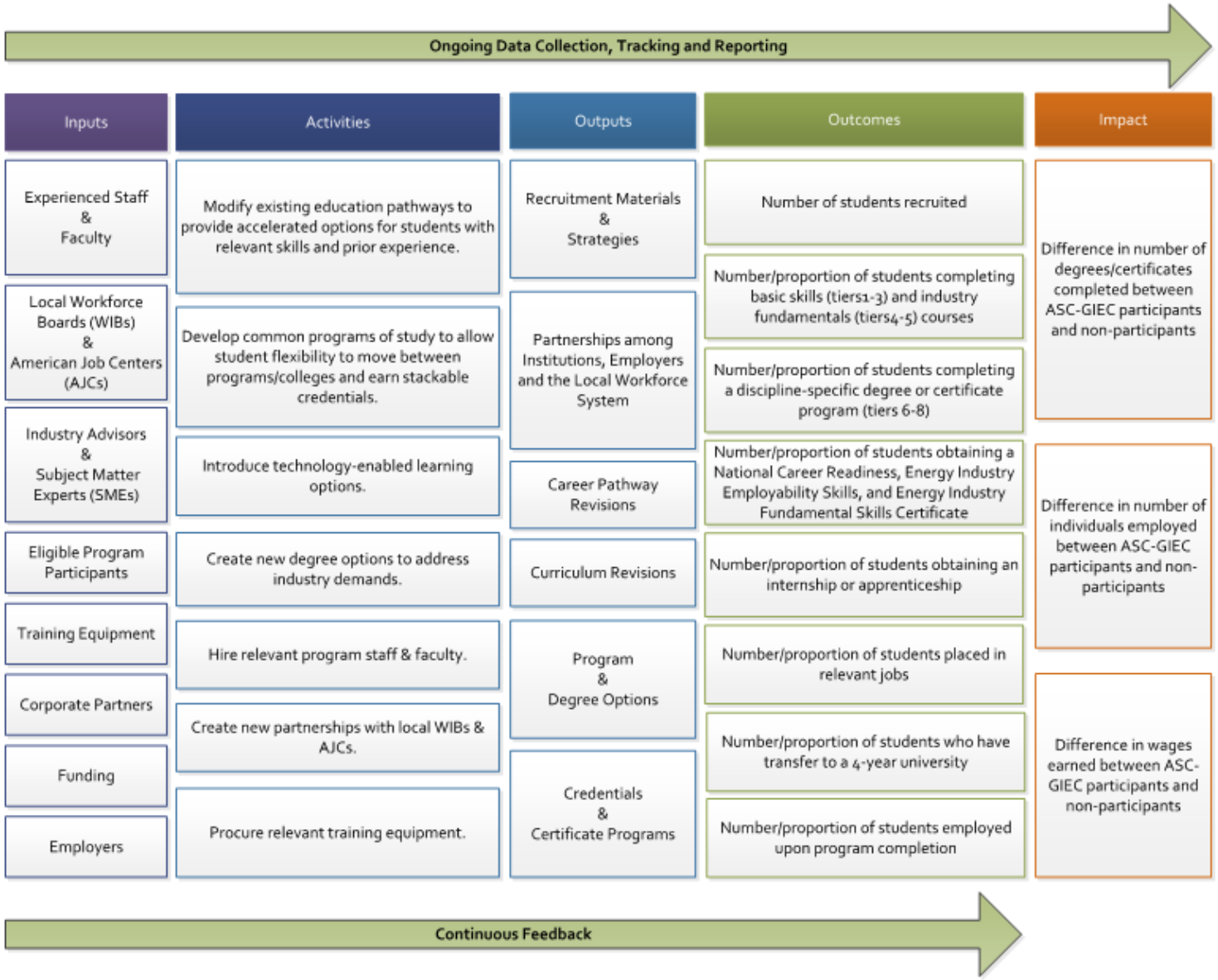
2.2 Program Strategies

All TAACCCT-funded programs must incorporate core elements to ensure each program produces high-skilled, high-wage employment opportunities for participants. The ASC-GIEC program adopted six specific strategies to achieve this goal:

1. Accelerate progress and readiness of TAA-eligible and other workers to identify and enter energy and mining education programs and careers.
2. Develop career pathways and build academic programs to provide qualified workers the skills to meet the needs of the energy and mining industries in the ASC.
3. Enhance and expand the ASC-GIEC career pathways model of stacked and latticed credentials with validated labor market value.
4. Embed and expand technology-enabled learning environments to increase access to educational opportunities.
5. Establish educational partnerships to ensure all ASC-GIEC courses, credentials, and credits are transferable among institutions.
6. Monitor and evaluate ASC-GIEC strategies to enhance program performance and achieve desired outcomes.

These strategies are reflected throughout the program's logic model (Exhibit 1).

Exhibit 1. ASC-GIEC Program Logic Model



The program logic model provides an overview of program inputs and activities as well as measures, outcomes, and impacts to be achieved during the life of the grant. The ASC-GIEC program **inputs** (i.e., resources that go into the program) include a variety of individuals and resources that are brought together to ensure the program meets its objectives. These include experienced program staff and faculty, Workforce Investment Board (WIB) and American Job Center (AJC) staff, industry advisors, subject matter experts (SMEs), employers, eligible program participants, equipment, corporate partners, and funding. The consortium assembled the majority of these inputs during the initial stages of program implementation; however, as discussed in Section 3, it took some time to procure equipment and establish relationships with local WIBs and AJCs.

The variety of program **activities** draw on the resources described above. These include creating and modifying program components, hiring individuals, creating partnerships, and procuring equipment. The grant-funded activities have been completed, as discussed in-depth in Section 3. However, the sustainability of these programs as pathways to energy careers will require ongoing support from consortium partners to ensure continued industry relevance and updating (e.g., replacing staff and faculty, adding new degree options, and/or updating technology-enabled learning and training equipment).

Program **outputs** include products, activities, and services produced through the activities described above. To varying degrees, the ASC-GIEC program has produced each of the outputs listed in the logic model, as discussed in Section 3. However, the sustainability of these outputs will require support in the post-grant period.

A discussion of ASC-GIEC inputs, activities, and outputs is included in the implementation study we describe in Section 3.

Program **outcomes** are specific goals of participant achievement (e.g., number/proportion of students completing the program and obtaining credentials). Section 4 of this report includes an analysis of outcomes based on student record data provided by the colleges along with other data sources as relevant. In Section 4, we provide analyses for all outcomes for which data were available. Relevant outcomes ideally include wage and employment as well as educational outcomes. Because of constraints in accessing these data, however, the range of outcomes we can evaluate is limited to educational outcomes.

ASC-GIEC program **impacts** relate to the program's effectiveness in helping participants improve their educational and labor market outcomes. Since a rigorous impact evaluation requires a robust comparison group, program impacts would ideally be evaluated by comparing the education and labor market outcomes for ASC-GIEC participants (treatment group) with those of student non-participants (comparison group). To be appropriately matched, the comparison group would include students similar to those who participated in the ASC-GIEC program, including completion of degree programs in similar fields. However, almost all similar programs at the consortium colleges were included in the ASC-GIEC program, rendering identification of a robust comparison group ultimately impossible. In its absence, IMPAQ's evaluation is limited to

a rigorous examination of program outcomes of ASC-GIEC participants relative to those enrolled in other career and technical education (CTE) programs at the consortium colleges.

2.3 Organizational Structure

To strengthen the ASC's talent pipeline and address the needs of the area's growing energy and mining industries, the ASC-GIEC colleges worked with a variety of industry and other stakeholders. This section describes the ASC-GIEC organizational structure of these partnerships. Further details on implementation of these partnerships over the life of the program are provided in Section 3.3.

2.3.1 ASC-GIEC Organizational Structure

During grant development, the ASC-GIEC established an organizational structure designed to maximize program capabilities and ensure successful implementation of all program strategies and goals. Appendix A illustrates this structure. The Industry Advisory Board, which met quarterly, served as the governing body of the ASC-GIEC and oversaw all aspects of the program. The ASC-GIEC Consortium Director led the Industry Advisory Board. Other members included:

- Center for Energy Workforce Development (CEWD)
- Representatives from each of the five consortium colleges
- Industry partners
- Science Foundation of Arizona (SFAz)
- Grant-funded staff

Exhibit 2 presents a detailed description of the member organizations (excluding the colleges and their staffs).

Each member of the Industry Advisory Board participated in one of three committees, each of which designed and implemented specific ASC-GIEC program goals and worked to ensure uniform program delivery across the colleges. The committees were:

- Workforce Planning Committee (WPC)
- Outreach and Communications Committee
- Curriculum and Instruction Committee

Exhibit 3 presents a detailed description of the membership and role of each committee. The sub-committees are in italics.

Exhibit 2. Industry Advisory Board Member Organizations

Member	Description	Responsibilities
CEWD	Non-profit consortium of energy providers and their representative associations that brings stakeholders together to build a skilled energy workforce and meet employer workforce demand	▪ Oversees Workforce Planning Committee. ▪ Provides technical assistance to the consortium in career pathway planning.
Industry Partners	Energy and mining companies throughout Arizona	▪ Serve on Industry Advisory Board to provide consultation on curriculum development, identify relevant training equipment, and advise on energy and mining labor market.
SFAz	Non-profit organization that facilitates STEM education opportunities across all public, private, and nonprofit organizations, colleges and universities statewide	▪ Provides assistance with course articulation between the community colleges and an engineering program at Arizona State University (a four-year institution)

Exhibit 3. ASC-GIEC Committee Membership and Responsibilities

Committee	Membership	Responsibilities
Workforce Planning	▪ CEWD (Lead) ▪ Industry partners ▪ College CTE administrators	▪ Manage workforce supply and demand discussions. ▪ Provide data on workforce projections for Arizona's energy and mining industry partners. ▪ Provide data on student enrollment and student success in pipeline programs.
Outreach and Communication	▪ College marketing and public relations coordinators (Lead) ▪ CEWD ▪ Industry partners	▪ Develop and implement the consortium's marketing and outreach plan. ▪ Build awareness of the strengthened energy education programs and workforce opportunities in the energy and mining industries in Arizona.
Curriculum and Instruction	▪ College CTE administrators (Lead) ▪ CEWD ▪ College/district curriculum councils (as needed) ▪ Industry workforce training representatives ▪ Program-specific faculty ▪ Trade unions (as needed)	▪ Manage course and program revisions/development to ensure maximum effectiveness and efficiency. ▪ Recommend needed training aids, capital equipment, etc. ▪ Develop and oversee process for faculty training.
Faculty Development Sub-Committee	▪ Industry partner (Lead)	▪ Identify professional development needs at colleges to ensure uniformity of tier 1-5 curriculum across the consortium.
Tiers 1-5 Sub-Committee	▪ CGCC staff (Lead)	▪ Develop and update core courses to include the tier 1-5 competencies. ▪ Monitor progress of new courses through the college curriculum review boards. ▪ Oversee credentials. ▪ Oversee teaching strategy, mode, and implementation of technology enabled learning tools.
Prior Learning Assessment (PLA) Sub-Committee	▪ CEWD (Lead)	▪ Develop common guidelines for evaluating prior learning.
Transfer and Articulation Sub-Committee	▪ SFAz (Lead)	▪ Oversee development of transfer agreements among the consortium colleges. ▪ Develop articulation agreements with four-year institutions.

The Consortium Director provided overall leadership and worked with the five community colleges to develop programs to help fulfill the state's energy workforce needs. To assist in these efforts, the grant funded three full-time positions: Project Director, Project Coordinator, and Public Relations Assistant. The grant also provided funding for each consortium college to hire a Project Coordinator, faculty, Career Coach, and Lab Technician. Exhibit 4 lists the responsibilities for each position.

Exhibit 4. Grant Funded Staff

Position	Responsibilities
Consortium-Wide Positions	
Consortium Director	▪ Principal investigator for ASC-GIEC TAACCCT grant ▪ Main point of contact for DOL ▪ Consortium representative at events such as DOL meetings, workforce conventions, and industry events ▪ Lead for Industry Advisory Board
Project Director	▪ Grant management ▪ Oversight of legal and financial agreements ▪ Oversight of reports to DOL
Project Coordinator	▪ Coordination of program activities ▪ Liaison between colleges and consortium members ▪ Tracking of ASC-GIEC enrollment and certificate completion ▪ Supporting Project Director in coordinating program budget
Public Relations Assistant	▪ Oversight of consortium outreach and communication ▪ Development and implementation of grant-marketing program ▪ ASC-GIEC website development and maintenance
Data Manager	▪ Assist in collecting and reporting student data for the third party evaluator
College-Specific Positions (Hired within Each Consortium College)	
Program Coordinator	▪ Oversee program within the college ▪ Tracking of student enrollment and credentials ▪ Oversight of college budget ▪ Liaison between college and consortium
Career Coach	▪ Outreach and recruitment ▪ Student advisement from enrollment through job placement ▪ Job preparedness including resume assistance, mock interviews, etc. ▪ Circulation of information about internship, apprenticeship, and job openings
Faculty	▪ Course teaching related to energy and mining curricula as relevant to the college-specific degrees(s)/certificate(s)
Lab Technician	▪ Ensuring equipment is maintained and used safely

3. IMPLEMENTATION STUDY

This section examines the ASC-GIEC program implementation at each participating college and across the consortium as a whole. Six broad research questions related to the objectives of the ASC-GIEC TAACCCT grant guide the study, as outlined in Section 3.1. In Section 3.2, we describe our approach to collecting and analyzing the data to answer these questions. In Section 3.3, we discuss findings related to each.

3.1 Research Questions

The implementation study examines six broad topics related to the grant objectives. To evaluate each, we developed specific research questions with input from the grantee (Exhibit 5).

Exhibit 5. ASC-GIEC Implementation Study Research Questions

Research Topic	Primary Questions
Program Context	How does the ASC-GIEC program address regional labor market needs?
Program Components and Service Delivery Strategy	What are the key components of the ASC-GIEC program and how were they delivered?
Program Participation	Who participated in the ASC-GIEC program and how were they recruited?
Partnerships	What contributions did each of the partners make in: (1) program design; (2) curriculum development; (3) recruitment; (4) training; (5) placement; (6) program management, including providing ongoing advice and guidance; (7) leveraging of resources; and (8) commitment to program sustainability?
Program Management, Funding, and Sustainability	What institutional management practices led to successful implementation of the project and allowed for the leveraging of other sources of project funding during and beyond the TAACCCT grant period?
Promising Practices and Lessons Learned	What lessons can the field learn from the ASC-GIEC program implementation?

To answer these research questions, the IMPAQ team used multiple data sources and analysis methods, as discussed in the following section.

3.2 Data Collection and Analysis

This study draws on a variety of data sources that provide insight into ASC-GIEC program contexts and implementation. Sources include information collected through three rounds of site visits, a web-based survey of ASC-GIEC participants, a review of relevant program documents, and IMPAQ team member attendance at five of the consortium's quarterly meetings.

3.2.1 Site Visits

Two members of the IMPAQ team conducted three rounds of site visits (Exhibit 6) to collect in-depth qualitative information about ASC-GIEC program implementation.

Exhibit 6. ASC-GIEC Site Visit Schedule

Site Visit	Project Month	Month, Year
1	Month 9	September 2013
2	Months 16–17	April–May 2014
3	Month 34	October 2015

During the first round of site visits (September 2013), we spoke with college administrators, faculty, and ASC-GIEC program staff about early implementation and successes and challenges related to:

- Consortium planning and communication
- Program planning and curriculum development
- Hiring and procurement
- Marketing and outreach planning

During the second round of site visits (April – May 2014) we again interviewed college administrators and faculty and staff, as well as workforce development and industry partners. These interviews focused on mid-implementation issues including:

- Consortium communication
- Curriculum delivery and alignment
- Program staffing
- Marketing and outreach activities
- Ongoing successes and challenges

In the final round of site visits (October 2015), we spoke with faculty and staff about overall implementation successes and challenges, as well as the sustainability of program elements developed with TAACCCT grant funding. The combined data from the three rounds enables us to assess program implementation across the three years of the grant and address the research questions guiding the evaluation.

We developed interview protocols organized to align with the research questions presented in Section 3.1. These protocols included open-ended questions and probes appropriate to each type of respondent (i.e., college administrators, program staff and faculty, career coaches, and employer and workforce partners). Appendix B includes the full interview protocols.

To ensure our data represented student perspectives on the program, the third round of site visits also included focus group discussions with ASC-GIEC program participants, which emphasized program experiences, satisfaction, and perceived outcomes. We conducted one focus group at each college with the exception of YC, where we conducted two in order to accommodate students at both the Chino and CTEC campuses. To ensure representation of a diversity of perspectives, the IMPAQ team provided the Program Coordinator with a sampling framework intended to maximize variation in terms of student background characteristics (i.e., gender, ethnicity, and age), degree program, and goals (i.e., certificate, associate's degree, and transfer to a four-year institution) (Exhibit 7). The Program Coordinator then used our framework to identify potential focus group participants and gain their participation.

Exhibit 7. Demographics of Student Focus Group Participants

College	CGCC	EMCC	NPC	PCC	YC	Combined
Total N	**9**	**5**	**8**	**7**	**18**	**47**
Gender						
Male	9	4	5	4	16	**38**
Female	0	1	3	3	2	**9**
Age						
18-25 Years	5	3	5	2	10	**25**
25-30 Years	0	0	0	2	5	**7**
30-35 Years	1	0	2	0	1	**4**
40+ Years	2	2	1	3	1	**9**
Enrollment Status						
Currently Enrolled	5	5	7	4	17	**38**
Completed Program	3	0	1	3	1	**8**
Left Program	1	0	0	0	0	**1**
Ethnicity						
American Indian	0	0	5	0	1	**6**
White	7	3	4	2	14	**30**
Latino/Hispanic	1	1	1	4	2	**9**
African American	1	1	0	1	2	**5**

Organizing the Site Visit Data. During the site visits, all interviews and focus groups were audio recorded with participant permission. IMPAQ's site visit team members then reviewed and compared interview notes to ensure accuracy. If this comparison revealed any gaps in knowledge or suggested additional questions, team members followed-up with the relevant interviewee or site visit liaison to clarify issues or solicit additional information. We then compiled detailed summaries based on field notes and reference to the audio recordings.

Analysis. IMPAQ used NVivo 10,[4] a qualitative analysis software, to manage and code notes from interviews and focus groups. Analysts applied an inductive coding strategy, in which the content of the data drives identification of themes or coding categories.[5] Each set of site visit notes was coded independently by two IMPAQ team members. The two coders then conferred to develop a shared understanding of code definitions, discussed discrepancies in their application, and resolved discrepancies through consensus. Throughout this process, initial code definitions were refined and new codes generated as needed to capture key concepts emerging from the data. The team repeated this iterative coding process until a stable set of codes emerged and all discrepancies were resolved (see Appendix C for the complete list of codes).

The researchers queried data from all rounds of site visits for codes and combinations of codes related to the ASC-GIEC strategies (see Section 2.2), student experiences, and program sustainability. Based on this analysis, team members compiled internal memos describing how implementation of the program developed over time. These memos informed the qualitative findings presented in this report.

3.2.2 Document Review

Program documents we reviewed included work plans, organizational charts, memoranda of understanding (MOUs), budgets, DOL-required reports (including quarterly narratives and annual performance reports), outreach materials, consortium newsletters, advisory committee meeting minutes, and other program documentation. ASC-GIEC staff posted these documents to the program's Dropbox folder, which was accessible to all consortium members and the IMPAQ team. The documents enabled us to identify key implementation issues and decisions as they occurred over the course of the grant. The documents also provided a timeline for tracking key milestones associated with program implementation and offered additional evidence regarding the status of specific strategies and milestones (e.g., gap analyses, curriculum reviews, and marketing materials).

3.2.3 Attendance at Quarterly Industry Advisory Board Meetings

Our analysis is also informed by attendance at five of the ASC-GIEC program's Industry Advisory Board quarterly meetings. The meetings took place in Fall 2013, Spring 2014, Fall 2014, Spring 2015, and Fall 2015. Meeting participants included grant-funded staff from consortium colleges, CEWD staff, representatives from SFAz, and employer partners. During these meetings, consortium committees worked in break-out sessions and colleges provided updates about program implementation. There were also discussions of the status of key program milestones and deliverables.

[4] http://www.qsrinternational.com/product

[5] http://fycs.ifas.ufl.edu/swisher/6802_15/Inductive2003.pdf

3.2.4 Participant Web-Based Surveys

To provide additional information about ASC-GIEC implementation from students' perspectives, IMPAQ fielded a web-based survey of program participants (see Appendix D for the survey instrument). The survey covered:

- Program goals
- Assessment of previous learning for credit
- Use of technology-enabled learning
- Career guidance
- Satisfaction with the program
- Employment

Over the course of the grant, we fielded the survey three times:

- Round 1: Spring 2014
- Round 2: Fall 2014
- Round 3: Spring 2016

In Spring 2014, we emailed the survey link to all students who had signed the program intake form and were over age 18. In the following rounds, we emailed the link to all students who had subsequently signed the intake form and were over 18, or did not respond to prior response request(s).

For all rounds, we offered an incentive of $20 to everyone who completed the survey. We received an overall response rate of 25 percent. Response rates varied substantially across colleges, with EMCC having the highest rate (34 percent) and NPC the lowest (15 percent) (Exhibit 8). We highlight key web-based participant survey findings relevant to the implementation study throughout this section (see Appendix E for complete results for each survey item).

Exhibit 8. Participant Survey Response Rate

College	Number of Students Sampled	Number of Students Who Responded	Response Rate
CGCC	319	81	25%
EMCC	495	167	34%
NPC	369	57	15%
PCC	286	82	29%
YC	259	56	22%
Total N	**1,728**	**435**	**25%**

Note: The total number of students who responded does not include the six students who did not report taking classes at any consortium college. The total number of students from each college includes the 15 dual enrollments. However, the overall total number of students only counts dually enrolled students once.

Based on these data sources, the following sections describe our findings for each research question.

3.3 Implementation Study Findings

The implementation study findings are organized according to the six research topics outlined in Section 3.1. For each topic, we:

- Describe the related program goals.
- Provide an overview of the related implementation process.
- Summarize successes and challenges.

3.3.1 Program Context – How does the ASC-GIEC program address regional labor market needs?

As described previously, the goal of the ASC-GIEC program was to train a skilled workforce to meet the anticipated hiring needs of Arizona's energy and mining sectors. The key occupations targeted by the program included: lineworkers, power plant operators, technicians, mining electricians, and engineers.

KEY FINDINGS

- While the consortium created a mechanism for predicting supply and demand in the form of the WDP model, it was challenging to get timely and accurate hiring projections from industry partners.
- The consortium effectively responded to changing labor market demands by including additional industry partners.

To ensure that the number of graduates met employer demands, colleges worked with employer partners through the WPC, as described in Section 2.3. Despite these efforts, it proved challenging to match the number of graduates to workforce demands. Towards the end of grant implementation, the projected number of jobs with initial industry partners did not materialize and the consortium had to make a number of adjustments.

3.3.1.1 Aligning Program to Employer Demand

To ensure the consortium graduated an adequate number of students to meet projected labor force demands, the consortium developed a process for matching the number of trainees with workforce needs. Throughout the implementation period, the WPC met during quarterly meetings of the Industry Advisory Board and held monthly conference calls between meetings. This committee developed and standardized a workforce development pipeline (WDP) model to assess the supply of jobs relative to the number of trainees participating in the ASC-GIEC program. The model was designed to leverage data streams from both consortium colleges and employers. Colleges were responsible for projecting the number of graduates, thereby forecasting the supply streams; employers were responsible for identifying projected workforce attrition, thereby forecasting the hiring needs.

To identify projected job openings in the energy and mining workforce, the WPC attempted to collect updated projections from industry partners but found several were not responsive to the data requests. As a result, the committee often had to report incomplete data to the Industry Advisory Board. By the October 2015 quarterly meeting, only four employers had provided their estimated hiring forecasts, which were then input into the WDP tools. Because of the limited amount of hiring data, however, the WDP model provided an incomplete picture of the energy and mining labor supply and demand in Arizona. This incomplete information, combined with a slowing economy, made it difficult for the consortium to strike a balance between the supply of program graduates and the industry demand for workers. To address this, the consortium added new industry partners, as described further below.

3.3.1.2 Expanding Partnerships

Over the life of the grant, as noted, the local energy and mining labor market demand in the ASC did not meet the expectations projected in the grant application. Two major factors contributed to the lower than expected hiring:

- The slowing of the national economy caused many workers who were eligible for retirement to remain in their jobs, leaving fewer than expected vacancies for program graduates.
- Changes in environmental regulation affecting the mining industry caused expansion plans to be put on hold and further slowed hiring.

By the end of the grant period (Spring 2016), the number of program completers outpaced the number of related job openings in the region.

Because hiring projections at the large industry partners – Palo Verde Nuclear Generating Station, Salt River Project (SRP), and Tucson Electric Power (TEP) – were all lower than anticipated, the consortium expanded the network of employer partners, with some success. Employer partnerships grew to include local businesses that contract with larger power providers in the area. As noted by one consortium member, the colleges “brought in more industry partners. In

the past we only partnered with one large employer, but we have worked really hard to bring in contractors and local industry." Three additional industry partnerships were established:

- Nestle Purina
- Amazon
- Chicago Bridge & Iron (CB&I)

Some focus group participants gave voice to the need to expand employer partnerships to improve prospects for job placement upon graduation. One student mentioned that the big energy companies are "not the only game in town, but [consortium staff] should give us more information about the other companies. We don't know what's out there." Another student suggested a one-semester experience class with different companies. "We need practice working with different companies, not only (Company X). At the end, they only have a few openings. We need more companies in the program so if you don't go to (Company X), you can go to this one or this one or that one. At least at the end we have a job."

Despite the inclusion of additional industry partners, however, many ASC-GIEC students expressed frustration with the lack of available jobs and internships in the area. Some were reluctant to expand their job search elsewhere, while others felt this was necessary. For example, one student noted, "local jobs get full pretty fast so you need to extend out your search a bit." Several students felt the program had been marketed to them as a direct line to jobs with specific energy employers but was not adequately delivering. They expressed frustration that the message had changed – from focusing on obtaining employment with these industry partners to focusing on energy jobs more broadly.

3.3.1.3 Summary of Successes and Challenges

Colleges and industry partners valued the opportunities the TAACCCT grant provided for collaboration, program development, and training. However, the consortium faced several challenges when attempting to balance the supply and demand for skilled workers in the energy and mining workforce. For example, despite friendly relations with industry partners, the WPC had difficulty obtaining updated hiring projections throughout the implementation period. As a result, the program lacked the necessary data to effectively adjust recruitment practices to the lower than expected demand for workers.

Generally, industry hiring did not meet original projections. By the end of the grant period, site visit respondents noted that the programs tended to produce more completers than there were jobs available in the ASC energy and mining industries.

3.3.2 Program Components and Service Delivery Strategy - What are the key components of the ASC-GIEC program and how were they delivered?

A key goal of the ASC-GIEC TAACCCT grant was to implement regional career pathways in the energy and mining sector. The consortium implemented multiple program components to achieve this goal:

- The ASC-GIEC competency model
- Industry-recognized credentials
- Prior learning assessments (PLAs)
- A variety of class delivery modes
- Expanded technology-enabled learning tools
- Training on industry-relevant equipment
- Expanded career preparation and guidance

3.3.2.1 The ASC-GIEC Competency Model

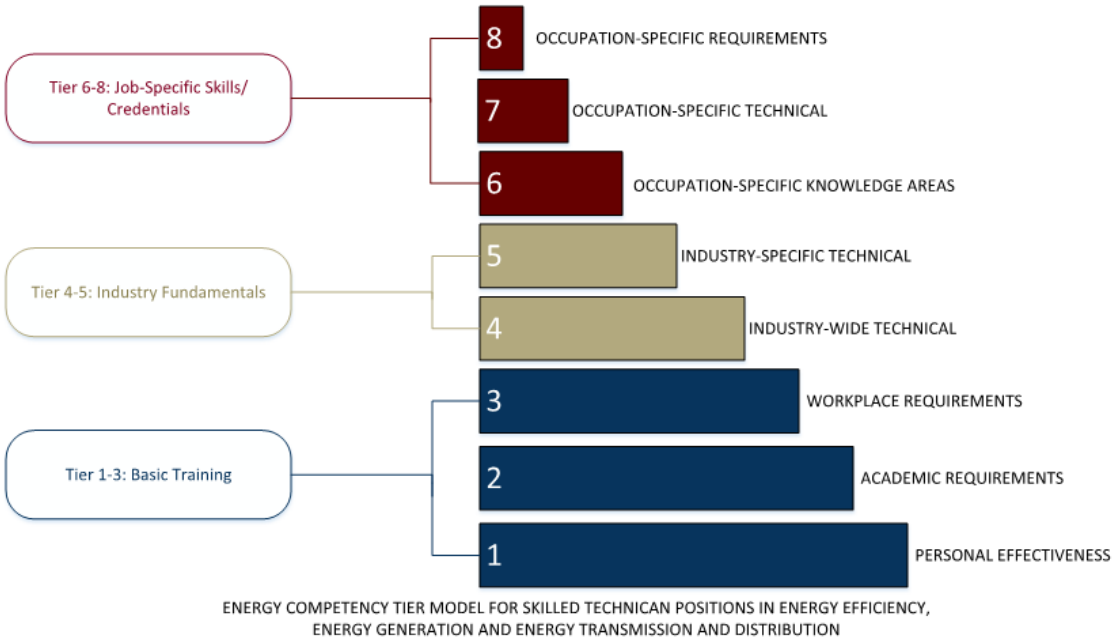
To ensure the ASC-GIEC program trained students in the skills needed by energy and mining employers, consortium members aligned CEWD's eight-tiered competency model (Exhibit 9) with the necessary energy and mining industry competencies, and ensured consistency in how these competencies were developed across the five consortium colleges.

Tiers 1-3 of the model cover basic career readiness training. This foundational coursework provides an overview of career planning through self-awareness and understanding. It also focuses on fundamental workforce skills – such as identifying specific personal goals, developing a resume, practicing interview techniques, and using technology to research the job market. In association with tiers 1-3, participants were given the opportunity to obtain the National Career Readiness Certificate (NCRC), as well as the Energy Industry Employability Skills (EES) Certificate.

Tiers 4-5 focus on industry fundamental skills and technical competencies. In the ASC-GIEC context, the foundational course covering tiers 4-5 provides an overview of the energy industry – including conventional and emerging fuel sources, power transmission and distribution, and the current structure of the U.S. energy industry. Depending on the career pathway the ASC-GIEC program participant pursue, the courses covering tiers 4–5 focus on industry-specific topics, such as power plant technology or mining. Regardless of the industry focus, participants are given the opportunity to obtain the EIF Certificate as part of completing tiers 4-5.

Finally, tiers 6-8 correspond to specialized courses and training focused on industry-specific demands. As such, these courses directly relate to the degree or certificate pursued by the student. (A full list of specific degrees and certificates offered by the ASC-GIEC program is included in Appendix F.)

Exhibit 9. ASC-GIEC Competency Model



To develop a common foundational curriculum for all energy and mining programs across the consortium, and enable students to transfer easily among ASC-GIEC programs, colleges mapped foundational courses covering tiers 1-5 to related competencies. Four of the five consortium colleges have two program-specific courses that cover the common curriculum – one to cover the competencies in tiers 1–3 and the other to cover competencies in tiers 4–5 (Exhibit 10). The fifth consortium member, NPC, has three courses that cover the same competencies.

Exhibit 10. Foundational Courses across Consortium Colleges

School	Tiers 1–3	Tiers 4–5
	Basic Skills	Industry Fundamentals
	Course Title	Course Title
EMCC	CPD 104	PPT 120
CGCC	CPD 104	NRG 101
NPC	HRE 103 TLC 103 BUS 103	MET 199 IMO 208/210
PCC	CPD 104	NRG 101
YC	CPD 104	PPD 220

Because each college has its own curriculum approval process and guidelines, it was not possible to enforce complete uniformity in foundational courses across the consortium. Therefore, to ensure all necessary competencies were covered within the relevant courses, the consortium created a list of all competencies the foundational courses must address. This enabled a gap analysis for each college to map each competency on the list to specific courses and verify the degree of curricular uniformity across the consortium. While the gap analysis allowed the

consortium to formally align the tier 1-5 curriculum across colleges, college partners expressed different levels of satisfaction with the gap analysis process.

Additionally, although the ASC-GIEC competency model emphasizes that participants should complete both the coursework and credentials associated with tiers 1-5, implementation of core curriculum varied by college, program, and cohort. A large portion of participants[6] never took the foundational courses associated with tiers 1-5 and many never received the associated credentials – implying that a substantial portion of participants may not, in reality, have developed the competencies associated with tiers 1-5. Site visit findings (supported by analyses presented in Section 4.4) suggest that this was partly because colleges found it difficult to compel students to take the foundational courses if these were not required as part of their degree program.

Focus group data show that students typically valued the course(s) covering tiers 1-3. Some said this course gave them confidence prior to joining the workforce, by identifying interests and goals and preparing them for the job search through resume writing and mock interviews. One student was "glad this course was mandatory. It helped me develop myself." Another agreed: "The course focused on our background and what we wanted to accomplish and how to make that work." Yet another felt the course helped him "build a foundation to sell myself to a future employer."

3.3.2.2 Credentials

As discussed above, the ASC-GIEC competency model embedded three stacked credentials across the five consortium colleges. The goal was to enable participants to demonstrate their skills to potential employers, and to have multiple entry and exit points throughout the program. Credentials associated with the ASC-GIEC program include:

- *National Career Readiness Certificate (NCRC).* ACT WorkKeys issues the NCRC, which is given to ASC-GIEC program participants in combination with the foundational course(s) covering tiers 1–3. The NCRC assesses academic work-readiness skills including reading, locating information, and mathematics.[7]
- *Energy Industry Employability Skills Certificate (EES).* Like the NCRC, the EES assessment is given in combination with the foundational course(s) covering tiers 1–3. SkillsUSA administers the assessment, testing ASC-GIEC program participants on their employability skills along with their basic knowledge of engineering and technology. An ASC-GIEC program participant must earn a score of 75 percent or higher to obtain the EES certificate.
- *Energy Industry Fundamental Skills Certificate (EIF).* The colleges, with CEWD approval, administer the EIF assessment, which is accredited by the American National Standards Institute (ANSI). ASC-GIEC program participants take this assessment in combination with

[6] For the purposes of this analysis, ASC-GIEC study participants are defined as individuals who signed the program intake consent form and are at least 18 years of age.
[7] http://www.cewd.org/SolutionGuides/CredSummary.pdf

the foundational course covering tiers 4–5. This assessment tests program participants' broad understanding of the electric and natural gas utility industry, as well as the generation, transmission, and distribution of energy. It ensures that potential workers gain an understanding of the energy industry as a prerequisite to occupation-specific training.[8] ASC-GIEC program participants must obtain a score of 68 percent or above to receive the EIF skills certificate.

As with the foundational courses, our outcomes study shows that only a relatively small portion of ASC-GIEC students completed these credentials (see Section 4.4). This appears related to three factors: (1) participants who entered the program early in its implementation never took advantage of these credentials; (2) students may have taken the tier 1-5 courses but never tested for the credentials, and (3) those individuals whose degree program did not require the ASC-GIEC foundational courses were less likely to seek the credentials.

Interestingly, although the goal of these credentials is to provide students with evidence of industry-recognized competencies they can take to their potential employer, a number of consortium stakeholders noted that – while employers value the skills testified to by a credential – they do not always recognize the credentials themselves. As one site-visit respondent noted, "There is a need to educate employers as to the value of the assessments and certificates."

Cases were noted, however, where employer partners were familiar with the credentials and saw them as an indicator of student competencies. For example, during the interview process, some industry partners, such as TEP and Palo Verde Nuclear Generating Station, said they give preferential treatment to ASC-GIEC students who have successfully completed the assessments and obtained the certificates listed previously. Therefore, all ASC-GIEC students are encouraged to list these credentials on their resumes and job applications, to signal preparedness for an internship or apprenticeship.

Student focus group participants also noted variation in employer awareness of the credentials. One participant noted, "Employers didn't even look at this certificate. It wasn't helpful to my application." But another student was offered a job on the spot, which he felt was directly related to the credentials he obtained through the ASC-GIEC program. Regardless of the employer's views of the credentials, many students felt they provided "a sense of accomplishment and confidence" during their interviews. One participant was "unsure they were helpful, but it's nice to have them on the resume."

3.3.2.3 Prior Learning Assessments

A central goal of career pathways systems is to accelerate job training for those with prior experience. In the ASC-GIEC program, PLAs, which are the designated mechanism for this,

[8] http://www.cewd.org/curriculum/about-the-eif-certificate.php

evaluate prior training for college credit.[9] In the context of the ASC-GIEC program, PLAs were generally related to prior college credits or military training.

To increase alignment across the consortium colleges, the Industry Advisory Board's Curriculum and Instruction Committee created a PLA subcommittee comprising representatives from each college. This subcommittee met on a regular basis to establish common guidelines for evaluating prior learning. Subcommittee members also mapped the PLA process, identified PLA commonalities, and developed a common approach to evaluating them. The subcommittee then developed a PLA Policy Statement and PLA Process Flow Chart, which each college approved in October 2014. The approved PLA policy focused on the recognition of formal learning through NCRC, EES, and EIF examinations, college credits, and military training. To ensure all ASC-GIEC staff had familiarity with the PLA process, a training webinar was held for relevant staff in November 2014, which reviewed the program's PLA requirements and process. Although all five consortium colleges approved the common PLA policy, there was no consistent PLA implementation process. At some colleges, PLA was the responsibility of the career coach. At others, it was the responsibility of the academic counselor or ASC-GIEC program coordinator.

While college staff described implementation of PLAs as an easy process, they reported rarely using them – which they often attributed to their view that few students entering the program had eligible experience. Discussions during the student focus groups, however, revealed that program participants had varying degrees of knowledge about PLAs. Some were aware of the possibility of receiving course credit for prior experience but said they did not have the necessary prior experience. Other students did have eligible experience but said they had not heard of PLAs until relatively late in their program experience. For example, one student said he had military engineering experience but the focus group discussion was the first time he had heard of PLAs. Another student, also with prior military experience, said he had learned about the PLA option only after a "casual conversation" with an ASC-GIEC faculty member. This student subsequently had his experience reviewed and counted for credit.

Results from the student survey (Exhibit 11) show that 47 percent of respondents overall (186) had their prior academic credits, certifications, and/or military experience reviewed to determine whether they could be counted for academic credit in the ASC-GIEC program. This number decreased substantially over time. Whether this was because PLAs were discussed less frequently as the program progressed, or because the number of respondents who did not have any prior learning experience increased, is unclear.

[9] https://www.acenet.edu/news-room/Pages/Adult-Learners-Guide-to-PLA.aspx

Exhibit 11. Web-Based Respondents who reported having PLAs, by Survey Round

Survey Round	1	2	3	Combined
Survey Date	Spring 2014	Fall 2014	Spring 2016	
Yes	59% *(N = 66)*	44% *(N = 32)*	41% *(N = 88)*	**47%** ***(N = 186)***
No	16% *(N = 18)*	28% *(N = 20)*	21% *(N = 46)*	**21%** ***(N = 84)***
I did not have any prior academic credits, certifications, and/or military experience	25% *(N = 28)*	28% *(N = 20)*	38% *(N = 81)*	**32%** ***(N = 129)***

Among the consortium colleges, EMCC survey respondents had the highest percentage (54 percent) of students who had their prior academic credits and experience reviewed to see if they counted for academic credit; NPC had the lowest, at 36 percent (Exhibit 12).

Exhibit 12. Web-Based Respondents who Reported Having PLAs, by College

School	CGCC	EMCC	NPC	PCC	YC	Combined
Yes	46% *(N = 35)*	54% *(N = 85)*	36% *(N = 19)*	42% *(N = 32)*	47% *(N = 22)*	**47%** ***(N = 186)***
No	24% *(N = 18)*	17% *(N = 27)*	32% *(N = 17)*	20% *(N = 15)*	21% *(N = 10)*	**21%** ***(N = 84)***
I did not have any prior academic credits, certifications, and/or military experience	30% *(N = 23)*	29% *(N = 45)*	32% *(N = 17)*	38% *(N = 29)*	32% *(N = 15)*	**32%** ***(N = 129)***

Note: Number of combined responses are less than the total college responses because of dual enrollment. The total number of students from each college includes the 15 dual enrollments. However, the overall total number of students only counts dually enrolled students once.

If colleges plan to maintain the PLA policy once grant-funding ends, the student focus group data suggest there may be opportunities for colleges to more effectively communicate the PLA opportunity to their entire student population.

3.3.2.4 Class Delivery Modes

Another key goal of the ASC-GIEC is to increase access to the training programs through online and hybrid delivery of courses, in order to make courses more accessible to working and rural populations. According to our interviews with college-level Program Coordinators, the colleges varied along this dimension as well.

Decisions regarding the course format depended on the community context, knowledge of the staff and faculty about the needs of the populations they serve, and course content. For example, many NPC students had to travel several hours to get to campus. To alleviate some of this travel,

most NPC courses had an online component and met in-person only once per week for a hands-on lab.

However, at some colleges, staff and faculty believed online courses require a higher level of self-discipline that many of their students lack. In addition, they felt that effectively serving their students with learning disabilities required face-to-face assistance and in-person classroom instruction to ensure success. Even among courses students can take online, staff said they often recommended that students register for the traditional in-person version, so instructors can provide one-on-one instruction, if necessary.

Options for online training tended to be more limited as students progressed through the program. One student noted: "My energy fundamentals class is all online. We go over all materials online." However, specific degree or certificate courses (tiers 6-8) were generally offered in-person or in a hybrid format with face-to-face sessions. Online course materials – such as notes, references, and PowerPoint – often supplemented these in-person sessions. As one student described it: "Most classes are in classrooms. [The instructor] will post notes and references online to help you understand more." Another student noted, "A lot of subject matter is too difficult to consume online." But others – particularly those who worked while taking classes – felt that online learning was important in making progress toward degree completion. As one focus group participant clarified, "I would like to have classes online because I start work in January and I want to finish my degree."

Some colleges also offered courses that were exclusively on-site at an industry partner's facility and taught by experienced industry professionals. All focus group participants who took these courses enjoyed them. Many students felt these classes were especially helpful because they provided a stronger understanding of the industry, employer, and relevant training equipment. According to one student, "we have access to the same equipment that is used in the field." Often, traditional classroom courses also incorporated on-site visits to local employers. Many students said they enjoyed this opportunity because it allowed them to make contacts with a local employer. One student explained that the "fieldtrips allowed me to get a foot in the door at [local employer]." Another student, who toured a local employer's worksite, said the employer "showed us their employee standards and explained what [students] had to do to be employed."

The findings from the participant survey (Exhibit 13) mirror the focus group discussions in suggesting that almost all students were taking at least some of their ASC-GIEC classes in a traditional classroom setting (82 percent, 329 respondents). Far fewer had taken online (23 percent, 93 respondents) or hybrid (34 percent, 135 respondents) courses. However, reports of courses taught in a traditional classroom settings decreased over time (from 90 percent to 77 percent), while reports of hybrid courses increased from 23 to 41 percent.

Exhibit 13. Types of Classes within the GIE Program, Over Time

Survey Round	1	2	3	Combined
Survey Date	Spring 2014	Fall 2014	Spring 2016	
Courses in a traditional classroom setting (including classrooms on and off campus)	90% *(N = 101)*	88% *(N = 63)*	77% *(N = 165)*	**82%** ***(N = 329)***
Online courses	21% *(N = 24)*	10% *(N = 7)*	29% *(N = 62)*	**23%** ***(N = 93)***
Hybrid courses (including both a traditional classroom component as well as an online component)	23% *(N = 25)*	29% *(N = 21)*	41% *(N = 89)*	**34%** ***(N = 135)***
Courses that exclusively include on-site training outside the classroom	21% *(N = 24)*	24% *(N = 17)*	23% *(N = 50)*	**23%** ***(N = 91)***

Note: Number of responses is in parentheses. Percentages are of total completed responses, which may total greater than 100 percent because respondents were able to select more than one option.

The proportions of students who took courses through these formats varied across colleges (Exhibit 14). Respondents from NPC and YC, the most rural colleges in the consortium, were the most likely to have taken hybrid courses (NPC: 47 percent, 25 respondents; YC: 57 percent, 26 respondents). As discussed above, the availability of hybrid courses and online courses helped meet the need of these colleges' rural populations.

Exhibit 14. Types of Courses GIE Students Took, by College

School	CGCC	EMCC	NPC	PCC	YC	Combined
Courses in a traditional classroom setting (including classrooms on and off campus)	79% *(N = 60)*	94% *(N = 147)*	51% *(N = 27)*	88% *(N = 68)*	78% *(N = 36)*	**82%** ***(N = 329)***
Online courses	22% *(N = 17)*	25% *(N = 40)*	25% *(N = 13)*	17% *(N = 13)*	33% *(N = 15)*	**23%** ***(N = 93)***
Hybrid courses (including both a traditional classroom component as well as an online component)	70% *(N = 53)*	27% *(N = 42)*	47% *(N = 25)*	30% *(N = 23)*	57% *(N = 26)*	**34%** ***(N = 135)***
Courses that exclusively include on-site training outside the classroom	42% *(N = 32)*	8% *(N = 13)*	43% *(N = 23)*	12% *(N = 9)*	46% *(N = 21)*	**23%** ***(N = 91)***

Note: Number of responses is in parentheses. Percentages are of total completed responses and may total greater than 100 percent because respondents were able to select more than one option. Number of combined responses may be less than the total by college because of dual enrollment. The total number of students from each college includes the 15 dual enrollments. However, the overall total number of students only counts dually enrolled students once.

3.3.2.5 Technology-Enabled Learning Tools

In addition to increasing the use of online course delivery, the ASC-GIEC strategies included a focus on expanding and embedding technology-enabled learning environments into the training programs. These tools allow instructors to merge virtual lectures, lab simulations, and other

technology students may find in the workplace into college courses. The consortium promoted the use of the following technologies to accomplish this goal:

- 3-D Computer Simulations
- Virtual Lectures
- E-Books and Podcasts
- Online Training Modules

Use of these technology-enabled learning tools varied across the consortium, often due to course delivery mode and topic requirements. Courses that took place in a traditional classroom setting often made use of virtual simulation labs, which were only available on campus. Faculty and students at NPC, YC, and CGCC were particularly happy with the online curriculum and virtual simulations included with the purchase of the Amatrol equipment, which was used by the Mechatronics, Electrical Instrumentation (EI), and Electric Utility Technology (EUT) programs. One focus group student explained that the program at his college had a "great lab that has everything you need for the electronics field." Another respondent agreed and said it was one of the "the best electronic labs in the state."

According to the participant survey, online training modules were among the most commonly used technology-enabled learning tools available to students (Exhibit 15). Across the consortium, 48 percent of respondents (188) noted that most, or almost all, of their ASC-GIEC courses used online training modules, with little variation over the course of the program. Virtual computer simulations, e-books, and podcasts were all used less frequently. While there was very little variation in the usage of e-books and podcasts over the course of program implementation, use of virtual computer simulations increased as implementation progressed (not shown).

Exhibit 15. Use of Technology-Enabled Learning Tools

Response Options	Almost all of my courses	Most, but not all of my courses	Less than half of my courses	No courses
Virtual Computer Simulation	13% *(N = 50)*	14% *(N = 54)*	28% *(N = 107)*	44% *(N = 168)*
E-books	17% *(N = 66)*	17% *(N = 63)*	22% *(N = 85)*	44% *(N = 165)*
Podcasts	2% *(N = 8)*	3% *(N = 12)*	12% *(N = 43)*	83% *(N = 306)*
Online Training Modules	26% *(N = 102)*	22% *(N = 86)*	28% *(N = 110)*	23% *(N = 90)*

Of the students who used the technology-enabled tools (Exhibit 16), the online training modules were thought to be the most useful (55 percent, 183 respondents). Of the students who addressed the issue of podcasts, more felt they were not at all useful (17 percent, respondents 52) than felt they were useful.

Exhibit 16. Usefulness of Technology-Enabled Learning Tools

Response Options	Not at all Useful	Somewhat Useful	Very Useful	Not Applicable
Virtual Computer Simulations	7% *(N = 22)*	23% *(N = 74)*	40% *(N = 128)*	30% *(N = 94)*
E-books	8% *(N = 24)*	30% *(N = 95)*	36% *(N = 113)*	27% *(N = 84)*
Podcasts	17% *(N = 52)*	14% *(N = 44)*	8% *(N = 26)*	60% *(N = 185)*
Online Training Modules	4% *(N = 12)*	29% *(N = 97)*	55% *(N = 183)*	12% *(N = 38)*

3.3.2.6 Tools and Equipment

To create industry-relevant career pathways, the ASC-GIEC grant enabled colleges to procure up-to-date training equipment used in the energy and mining fields. The specific equipment varied according to the degree or certificate but included, for example, mechatronics and electrical instrumentation lab stations, pumps, valves, climbing polls, and trucks. Procuring this equipment was essential to ensure training aligned with industry standards. ASC-GIEC faculty and staff worked with local employers within the energy and mining industry to procure equipment that matched that in employer facilities.

During the first year of the grant, there were delays in the equipment procurement process (see Section 3.3.5 for discussion). For example, NPC received its Amatrol equipment but suffered from delays in the construction of its new Skills Center,[10] which was to house the mechatronics lab. Procurement delays created anxiety among the faculty about their colleges' ability to meet ASC-GIEC implementation milestones, which depended on having heavy equipment and appropriate facilities. By Spring 2015, major equipment purchases had begun to arrive on the campuses, and by Fall 2015, all five colleges had procured their essential training equipment. From that point on, equipment costs primarily consisted of updates and maintenance. However, several respondents pointed out that each college will need to keep up with emerging technology and respond to changes in employer and industry demands going forward – indicating that equipment procurement will be an ongoing need.

Both students and faculty expressed satisfaction with the quality of the equipment purchased through the TAACCCT grant. Faculty in the EUT programs at PCC, YC, and CGCC said they were particularly pleased with the training facilities and vehicles available to students. They were also pleased with the effective integration of the equipment into the ASC-GIEC programs. Similarly, faculty within the EI and Mechatronics programs at YC and NPC were satisfied with the Amatrol equipment, which included online curriculum and virtual labs and training for participating faculty on the integration of those tools into industry-specific training programs.

[10] The construction of the NPC Sills Center was not funded through the TAACCCT grant.

All focus group participants felt that the equipment used in their courses helped prepare them for jobs in the energy and mining industries. Across colleges, students emphasized the importance and value of hands-on training using the same equipment they will find in the field. As one student explained, the instructor created "real work problems and had [the] class work on those areas" using actual equipment. Another student who took an on-site course enjoyed the opportunity to learn about, and work with, equipment used on-site. This student explained that the "employer has access to the same equipment that is used in the field. If we weren't able to use some equipment, we were given a demonstration by an employee." Comments in the student survey (Exhibit 17) show that respondents also felt the hands-on training was helpful in preparing them for employment in the energy or mining sector.

Exhibit 17. Participant Survey Comments – Preparing for Employment

Thinking about your time in the GIE program, what would you say have been the *most helpful* experiences in preparing you for employment in the energy or mining sector?
Hands on lab experience. It's one thing to pass a class with a grade it is another to retain the information years down the road. E and I program has a great lab and I hope that they can continue to expand.
Hands on training with tools, equipment, and vehicles that I will be working with in my trade.
The hands on experience offered at [college] has been the most helpful. The lab and equipment are a great learning tool.
A top notch lab with the equipment for hands on experiences and I can't emphasize it enough, the instructor, with his experience and teaching methods has by far been the best motivating factor since my return to college.

According to the participant survey, 56 percent of respondents agreed or strongly agreed that they had the opportunity to work with the actual tools and apparatus found in local energy and mining plants and facilities (Exhibit 18). There was a 13 percentage point increase in the number of respondents who agreed or strongly agreed with this statement from the first to the third round of the survey – not surprising since the colleges had only fully procured all their equipment by the third survey. Additionally, since by the time of the third survey round many ASC-GIEC student respondents had progressed far enough toward their degree or certificate, respondents were more likely to be taking courses that offered hands-on training.

Exhibit 18. Had the Opportunity to Work with Tools and Apparatus in the Energy and Mining Plants and Facilities

Response Options	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Not Applicable
College						
CGCC	55% *(N = 41)*	23% *(N = 17)*	5% *(N = 4)*	5% *(N = 4)*	1% *(N = 1)*	9% *(N = 7)*
EMCC	19% *(N = 29)*	22% *(N = 34)*	18% *(N = 27)*	10% *(N = 16)*	10% *(N = 15)*	21% *(N = 32)*
NPC	33% *(N = 17)*	35% *(N = 18)*	8% *(N = 4)*	10% *(N = 5)*	6% *(N = 3)*	10% *(N = 5)*
PCC	23% *(N = 17)*	23% *(N = 17)*	12% *(N = 9)*	9% *(N = 7)*	12% *(N = 9)*	21% *(N = 16)*
YC	53% *(N =24)*	31% *(N = 14)*	7% *(N = 3)*	0% *(N = 0)*	9% *(N = 4)*	0% *(N = 0)*
Survey Round						
Round 1 Spring 2014	30% *(N = 32)*	20% *(N = 21)*	20% *(N = 21)*	11% *(N = 12)*	5% *(N = 5)*	15% *(N = 16)*
Round 2 Fall 2014	23% *(N = 16)*	25% *(N = 18)*	8% *(N = 6)*	8% *(N = 6)*	11% *(N = 8)*	24% *(N = 17)*
Round 3 Spring 2016	35% *(N = 73)*	28% *(N = 58)*	10% *(N = 21)*	6% *(N = 13)*	9% *(N = 18)*	12% *(N = 26)*
Total	**31% *(N = 121)***	**25% *(N = 97)***	**12% *(N = 48)***	**8% *(N = 31)***	**8% *(N = 31)***	**15% *(N = 59)***

Note: Number of combined responses may be less than the college total because of dual enrollment. The total number of students from each college includes the 15 dual enrollments. However, the overall total number of students only counts dually enrolled students once.

Student focus group participants had mixed opinions about whether the program provided sufficient hands-on training with industry equipment. Some students felt there were too few opportunities. As one participant put it, "the amount of hands-on we do is so limited that I don't think they should really advertise so much that it's hands-on learning." Some students attributed what they saw as too little hands-on training to a lack of integration of hands-on learning into courses. At EMCC, for example, a few students felt that coursework was oriented towards learning from the textbook rather than using the equipment. Other students, however, felt that hands-on learning did become available in more advanced classes – although some NPC students expressed concern that the amount of equipment was insufficient for the number of students. They were pleased with the Amatrol equipment used in classes, but mentioned that there were more students than the equipment could accommodate.

3.3.2.7 Career Preparation and Guidance

Early feedback from industry partners on the curriculum development process suggested that, in addition to industry-specific skills and competencies, employers valued soft skills that included

workers' ability to communicate effectively through job applications, resumes, and interviews. Therefore, the curriculum included career preparation activities such as resume writing, job search techniques, and mock interviews to help students as they prepared for, or were in the process of, entering the workforce. Within the ASC-GIEC program, these services were introduced in the tier 1-5 courses and supported by the Career Coach. In addition to recruitment responsibilities, Career Coaches worked very closely with ASC-GIEC students in assisting with job preparation and placement – services that focus group respondents widely praised.

Across colleges, focus group participants frequently cited job preparation assistance from Career Coaches, specifically mock interviews and resume workshops, as especially valuable. A student from one college identified the Career Coach's interviewing course as particularly important because without preparation, "there are a lot of people who freeze up, one student froze up and lost the second round of interviews." At another college, students agreed that the mock interviews and resume help were key to their future success. As one student noted, the tiers 1-3 basic skills class "was the most beneficial class I have ever taken. It is tailored to the industry and you do mock interviews with industry leaders. I have 24 years of experience, and I learned how to target my resume."

Career coaching at PCC followed an especially effective case management approach, in which Career Coaches assist the student from program start to finish. During one-on-one meetings, the Career Coach reviews the student's education plan, provides resume assistance, and offers community resources if needed. The Career Coach also addresses any barriers hindering the student's academic success, such as issues with schedules, instructors, or financial aid. At a minimum, these meetings occur once a semester, but the Career Coaches also maintain close contact with their students through email. When referring to the availability of Career Coaches under this case management approach, one PCC student said, "Yes, they are available anytime. If they're not in, they just call me back to ask what is going on. It is very helpful. They're on top of it."

Focus group participants also noted that course instructors provided extensive career guidance. Many students attributed this to their instructor's strong relationship with local employers. According to one student, the instructor had "a good relationship with SRP," which was helpful when it came time to apply to apprenticeship programs.

The participant survey supports these findings (Exhibit 19) – with 78 percent of respondents (248) receiving career guidance from their instructors. A little over a third of respondents received guidance from the Career Coach (36 percent, 116 respondents). This suggests that while students who took advantage of the services provided by Career Coaches appreciated them, many did not take advantage of the full career pathway planning Career Coaches were able to offer. Another possibility is that the students were not fully aware of the services offered. At some colleges, for example, the Career Coaches teach the tier 1-3 basic skills course, which may make some students assume they are instructors.

Exhibit 19. Percent of Survey Respondents Who Receive Career Guidance over Time

Survey Round	1	2	3	Combined
Survey Date	Spring 2014	Fall 2014	Spring 2016	
Campus Career Center	42% *(N = 38)*	35% *(N = 19)*	39% *(N = 66)*	**39% *(N = 123)***
Instructors	78% *(N = 71)*	85% *(N = 47)*	76% *(N = 130)*	**78% *(N = 248)***
Current employer	25% *(N = 23)*	18% *(N = 10)*	19% *(N = 34)*	**21% *(N = 67)***
GIE career coach	33% *(N = 30)*	45% *(N = 25)*	36% *(N = 61)*	**36% *(N = 116)***
Industry professionals	55% *(N = 50)*	44% *(N = 24)*	43% *(N = 73)*	**46% *(N = 147)***
None	17% *(N = 19)*	24% *(N = 17)*	20% *(N = 42)*	**20% *(N = 78)***

Note: Number of responses is in parentheses. Percentages are of total combined responses and the total combined percentage may be greater than 100 percent because respondents were able to select more than one option.

3.3.2.8 Summary of Successes and Challenges

While the consortium formally aligned the tier 1-5 curriculum across the consortium, how colleges integrated competencies across the consortium varied. NPC found it challenging to create two new courses to cover those competencies, as noted, so instead embedded the tier 1-5 competencies in existing courses. Interestingly, NPC did in the end accommodate student transfers by creating distinct course numbers for granting credit to transferring students who had earned the basic tier 1-5 competency credits from other consortium colleges. Students expressed mixed views about the value of the tier 1-5 courses and corresponding credentials, however; and the outcomes study reveals that student participation in these courses and associated credentials was limited.

Use of PLAs was also limited. Students indicated that they might have benefited from PLAs had they been made aware of the opportunity, as also noted, suggesting that a more systematic PLA process could potentially increase its benefit to students.

After initial procurement delays, the colleges did successfully incorporate relevant tools and equipment used in the field, and both students and faculty said the program provided the technical experience requested by employers. Use of technology-enabled learning tools varied by program and college, but did increase over the course of the grant.

Students expressed consistent satisfaction with the career preparation provided by the Career Coaches and the career guidance provided by instructors and their industry contacts. However, concern about sustaining the Career Coach role after the grant was voiced across the consortium, as discussed in Section 3.3.5.

3.3.3 Program Participation - Who participated in the ASC-GIEC program and how were they recruited?

To recruit TAA-eligible and other potential student populations, the ASC-GIEC program developed a comprehensive outreach and recruitment plan. This plan provided information about the linkages between the program and access to careers in energy and mining. Below we describe how the consortium implemented these outreach and recruitment efforts and tailored them to targeted populations.

KEY FINDINGS

- The consortium developed a comprehensive and integrated marketing and recruiting plan.
- Word of mouth and employer-initiated recruitment were particularly effective tools.
- The consortium had difficulties recruiting TAA-eligible workers and women.

3.3.3.1 ASC-GIEC Marketing and Outreach

The consortium developed its detailed marketing and public relations plan in Year 1. This plan included elements that each college could use to create its own program-specific marketing materials – such as an ASC-GIEC program logo; marketing templates; and an overview of the program's goals, tactics, and strategies. Although each college integrated these elements into its communication and outreach efforts, the ASC-GIEC marketing plan helped establish a cohesive and unified brand that could be used across the consortium.

The consortium's Public Relations Assistant oversaw recruitment and outreach activity for all five colleges, maintained and updated ASC-GIEC program information, trained key college staff on planned approaches, coordinated joint recruitment efforts among colleges, and facilitated communication among the Career Coaches, who were also heavily involved in the recruitment process. The Public Relations Assistant also helped develop the ASC-GIEC website, which was launched in Year 1. The website discussed the program and career pathways, outlined the discipline-specific degrees and certificates offered by each college, and provided links to each college's official website.

The marketing and recruitment strategy expanded in Year 2 to include a social media presence on Facebook, Twitter, and YouTube. The updated plan also encouraged all consortium partners and college staff to conduct outreach and recruitment events targeting their local community and specifically TAA-eligible individuals. These events included:

- Program open houses
- Outreach by career coaches to local employers, high schools, and community events
- Press releases
- Announcements at college-wide recruitment events

Local employers played an important role in marketing the ASC-GIEC program to the local population. For example, TEP sent an ASC-GIEC program flyer to local households, which seemed to have had a positive effect – judging by the handful of PCC focus group participants who said they first heard about the program through a TEP flyer, and by one student's reference to the ASC-GIEC program as the TEP program.

While the formal marketing effort was helpful in creating a unified brand, the most important way of attracting new students turned out to be word of mouth. The majority of program participants attending the focus group sessions said they first heard about the ASC-GIEC program through a family or friend. Many of the student focus group participants who had worked, or were currently working, in the energy industry also reported hearing about the program from their employer or colleagues. For example, one student, who had not been interested in pursuing a degree or certificate, found out about the program through her employer. The student explained that, while the degree or certificate was not required for her job, "it looks good on a resume." As a result, she signed up for the program and began taking classes.

Information gathered from the ASC-GIEC participant intake form closely aligned with what we learned during site visits (Exhibit 20). Overall, a plurality of students (38 percent, 419 respondents) reported hearing about the program through word of mouth, while less than one percent of students (8 respondents) heard about the program through their local AJC. Of those who did hear about the program through their AJC, six of the eight were students at PCC – not surprising, since PCC had the strongest relationship of all the consortium colleges with the local AJC, according to our site visit data (see section 3.3.4 for detail). About 10 percent (105 respondents) heard about the program through their local high school.

Exhibit 20. How Students Heard about the ASC-GIEC Program, by College

School	CGCC	EMCC	NPC	PCC	YC	Combined
Advertisement	16% *(N = 12)*	21% *(N = 16)*	18% *(N = 14)*	29% *(N = 22)*	17% *(N = 13)*	**7%** ***(N = 77)***
Career Fair	7% *(N = 2)*	34% *(N = 10)*	10% *(N = 3)*	14% *(N = 4)*	34% *(N = 10)*	**3%** ***(N = 29)***
High School	6% *(N = 6)*	24% *(N = 25)*	20% *(N = 21)*	3% *(N = 3)*	48% *(N = 50)*	**10%** ***(N = 105)***
American Job Centers (AJCs)	0% *(N = 0)*	25% *(N = 2)*	0% *(N = 0)*	75% *(N = 6)*	0% *(N = 0)*	**1%** ***(N = 8)***
Recruiter	6% *(N = 3)*	20% *(N = 11)*	2% *(N = 1)*	20% *(N = 11)*	52% *(N = 28)*	**5%** ***(N = 54)***
Word-of-Mouth	19% *(N = 79)*	23% *(N = 95)*	19% *(N = 78)*	28% *(N = 118)*	12% *(N = 49)*	**38%** ***(N = 419)***
Other	40% *(N = 164)*	24% *(N = 99)*	21% *(N = 88)*	12% *(N = 48)*	3% *(N = 11)*	**37%** ***(N = 410)***

Note: Numbers of responses are in parentheses. College percentages are of total completed responses. Number of combined responses may be less than the total college responses because of dual enrollment.

When discussing what persuaded them to actually enroll, student focus group participants mentioned a variety of factors. These included career opportunities and estimated salaries, the low cost compared to other out of state programs, and the relatively short time to completion (which students said would enable them to obtain a degree or certificate and enter the workforce more quickly than enrolling in a four-year program). The prospect of having a definite, sustainable career after program completion also appealed to many. As one student participant said, "I liked knowing this job will be a career and not just go away in 10 years. There are older guys who will be retiring and we will be the younger guys to fill in their place."

The participant survey supports these findings (Exhibit 21). Over half of respondents (56 percent, 185 respondents) said the information provided by the ASC-GIEC program about career opportunities in the energy and mining sectors influenced their decision to enroll. Nearly two-thirds (60 percent, 197 respondents), said the opportunity to obtain multiple industry-recognized credentials influenced their enrollment decision.

Exhibit 21. Which of the following influenced your initial decision to enroll in the GIE program? (Check all that apply)

Survey Round	1	2	3	Combined
Survey Date	Spring 2014	Fall 2014	Spring 2016	
Information provided by the GIE program about career opportunities in the energy and mining sectors	67% *(N = 60)*	45% *(N = 26)*	54% *(N = 99)*	**56% *(N = 185)***
Opportunity to attain multiple industry-recognized credentials through the program	69% *(N = 61)*	71% *(N = 41)*	52% *(N = 95)*	**60% *(N = 197)***
The flexibility to take classes online or through distance learning	11% *(N = 10)*	24% *(N = 14)*	20% *(N = 37)*	**18% *(N = 61)***
The flexibility to take classes at a variety of colleges affiliated with the GIE program	10% *(N = 9)*	17% *(N = 10)*	15% *(N = 27)*	**14% *(N = 46)***
The opportunity to have prior academic credits, certifications, and/or military experience reviewed to determine whether they could be counted for academic credit in the GIE program	26% *(N = 23)*	23% *(N = 13)*	16% *(N = 30)*	**20% *(N = 66)***
The ease of applying credits earned in the GIE program toward engineering or energy-related degrees at Arizona State University	16% *(N = 14)*	17% *(N = 10)*	17% *(N = 32)*	**17% *(N = 56)***
None of the above	21% *(N = 23)*	21% *(N = 15)*	16% *(N = 34)*	**18% *(N = 72)***

Note: Number of responses is in parentheses. Percentages are of total completed responses, and the total percentage may be greater than 100 percent because respondents were able to select more than one option.

3.3.3.2 Recruiting TAA-eligible Workers

The overall goal of the TAACCCT grant program is to expand education and career training opportunities for workers eligible for training under TAA. The ASC-GIEC grant application noted that the 15 TAA certifications granted in Arizona in 2011 alone covered over 4,000 workers. Even

so, the consortium has found it difficult to identify and recruit TAA-eligible workers. While recruitment of the TAA-eligible population gradually increased toward the end of the grant period, the overall number of TAA-eligible participants remains relatively small at all colleges other than CGCC. To date, only 114 of the 1,214 participants for whom data are available have identified themselves as TAA-eligible.[11]

One challenge in recruiting TAA-eligible individuals is the difficulty local WIBs have in identifying this population. Since employers are not required to immediately provide WIBs with contact information for their TAA-eligible workers, it can take up to eight months for local WIBs to identify TAA-eligible workers. Additionally, employers with TAA certification are not required to provide laid-off workers with information regarding their employee benefits and available training (such as the ASC-GIEC program). As a result, dislocated workers must use the WIBs to seek out the requisite information on their own.

The difficulty recruiting TAA-eligible individuals was compounded by the time it took for ASC-GIEC colleges to develop partnerships with their local WIBs and AJCs. Even when established, these relationships varied substantially, with some AJCs working much more closely with consortium colleges than others (see Section 3.3.8 for detail).

3.3.3.3 Recruiting Other Populations

The consortium colleges have found it difficult to recruit women. They tried to address this through such tactics as having program staff invite women to discuss the program at open houses. As we show in Section 4.3.1, the portion of female participants slightly increased later in the grant period, but overall only 10 percent of ASC-GIEC program participants have been female. Colleges have also found it difficult to recruit Veterans, despite targeted efforts to do so. For example, staff at YC conducted multiple outreach events at military bases, but these yielded no response at all from potential students. Additionally, staff at PCC worked closely with a local community organization to recruit Veterans, but saw only a very limited result. One site visit respondent suggested that it would have been helpful to establish a comprehensive strategy for recruiting Veterans at the very beginning of the grant.

3.3.3.4 Summary of Successes and Challenges

A major success of the grant was the centralized marketing and outreach planning and early development of branded marketing materials used by all the consortium partners. This allowed all colleges and employer partners to use the same ASC-GIEC logo and language, while still tailoring marketing materials to the relevant degrees and certificates offered locally. Successful marketing materials included flyers, brochures, and a website. Marketing activities included open houses, visits to local employers and high schools, press releases, and announcements at in-house recruitment events.

[11] This is based on the available data from the student intake forms.

Participants learned about the program from a variety of sources, including employers that are consortium partners, recruitment events such as open houses and career fairs, word of mouth (from friends or family), and flyer mailings. Students also reported finding the ASC-GIEC website helpful for accessing detailed information about specific courses of study and enrollment deadlines.

While program staff worked to develop relationships with local AJCs to market the program to the TAA-eligible population, recruiting TAA-eligible workers proved to be a challenge. It was not possible to identify TAA-eligible workers and contact them directly. In addition, the former employers of TAA-eligible workers are not required to inform those individuals about federally funded training programs available to them. Therefore, the effectiveness of outreach to TAA-eligible workers depended on the local AJC's own efforts, which varied. Future DOL grant programs might consider providing contact information for the target population to help make grantees' recruitment efforts more effective.

3.3.4 Partnerships – What contributions did each of the partners make?

As discussed previously, the ASC-GIEC consortium relied on relationships between the community colleges and a number of other types of partners, including:

- Industry partners
- Non-profit organizations
- Workforce organizations

KEY FINDINGS

- The program was characterized by very strong partnerships with industry and non-profit organizations.
- The strength of partnerships with workforce organizations varied across colleges.

Initial consortium partnerships included EMCC, CEWD, SFAz, and the energy industry partners previously involved with the AEWC; two employers from the mining industry later joined as consortium partners. Local WIBs and AJCs worked on program recruitment through their respective consortium community colleges; however, these workforce organizations did not participate in the Industry Advisory Board.

3.3.4.1 Industry Partners

Throughout the grant, industry partners played an important role in the consortium (Exhibit 22). As instrumental parts of the Industry Advisory Board they provided:

- *Guidance on curriculum development* – For example, SRP was very involved in ensuring that CGCC students have sufficient math skills to pass the company's pre-employment exam. TEP also provided advice on curriculum and training equipment purchases.
- *Instructors for ASC-GIEC courses* – Some employers encouraged their employees to serve as adjunct faculty members at the consortium colleges. Students in the focus groups said they appreciated taking courses from these instructors, because they provided industry

contacts, provided relevant examples of topics discussed in class, and had good communication skills.

- *Guidance on equipment* – These partners also provided guidance on equipment purchases to ensure the training was directly transferable to the workplace. As noted previously, students appreciated the ability to train on the equipment that energy and mining companies use. Many of the employers donated equipment to ensure the currency of student training to industry standards. For example, Palo Verde provided pumps, valves, head exchangers, and various other types of nuclear power plant equipment to EMCC; Freeport Mines donated equipment to YC.
- *Jobs, internships, and apprenticeships for graduates* – While the projected number of jobs with employer partners did not materialize, industry partners were eager to hire ASC-GIEC graduates when they had openings. Students in one of the focus groups mentioned that the program gave participants an inside track to employment with local companies. According to one student, linemen previously would ask who a new hire's relative was (assuming that was how s/he got the job), but now they ask if the new hire went through the ASC-GIEC program.

Exhibit 22. Partner Affiliations and Contributions

Partner Organization	Affiliated Colleges	Program Design	Curriculum Development	Recruitment	Training	Job Placement	Program Management	Leveraging Resources	Program Sustainability
Employer Partners									
Amazon	NPC					✓			
APS	EMCC, CGCC, NPC	✓	✓	✓	✓	✓		✓	✓
ASARCO	YC				✓	✓			
CB&I	NPC					✓			✓
Drake Cement	YC					✓			
Freeport Mines	PCC, YC				✓	✓		✓	
Glen Canyon Dam	NPC					✓			
Nestle Purina	NPC					✓			
McMorRan Copper & Gold	YC				✓	✓			
Palo Verde NGS	EMCC	✓	✓	✓	✓	✓		✓	✓
Southwest Gas	NPC, PCC					✓			✓
SRP	CGCC, NPC	✓	✓	✓	✓	✓			✓
TEP	NPC, PCC	✓	✓	✓	✓	✓		✓	✓
Non-Profit Partners									
CEWD	All	✓	✓				✓		
SFAz	All	✓	✓				✓		
Workforce Development Partners									
WIBs and AJCs	All			✓					

Over the course of the grant, relationships between the colleges and industry evolved from an advisory role to a more collaborative partnership. A shared vision for the project – to help students find stable employment and ensure a sufficient supply of qualified workers while building a foundation for sustained partnerships – helped foster effective collaboration.

Partnerships between the colleges and employers have laid the foundation for potential collaborations beyond the end of the grant. For example, CGCC is currently discussing development of a training program with SRP, where lectures would occur on campus and hands-on training at SRP facilities. This program is still under discussion, but respondents said this collaboration was the result of relationships developed through the grant. Additionally, industries that are part of NPC's Mechatronics Advisory Board continue to be involved in discussions about curriculum and long-term program development.

While employer relationships have been strong overall, there have been challenges. For example, YC has relationships with Arizona Public Service (APS) and SRP, but some respondents expressed disappointment that the grant had not resulted in additional partnerships with industry. These respondents had expected the grant would lead to employers more actively seeking them out. Instead, they felt, efforts to bring in new industry partners have been somewhat one-sided – that college staff had been reaching out to employers rather than vice versa. The geographic distance of the college from the relevant employers was cited as one factor limiting the development of stronger relationships with industry partners.

3.3.4.2 Non-Profit Organizations

CEWD and SFAz were the primary non-profit organizations collaborating with the consortium. CEWD is a consortium of electric natural gas and nuclear utilities formed to help utilities work together to develop solutions to the coming workforce shortage in the industry. CEWD played an active role in the ASC-GIEC consortium. Staff members oversaw the WPC and provided a national perspective on workforce planning in the energy sector. They also took on a leadership role on the Curriculum and Instruction Sub-committee on Prior Learning Assessment. Through such activities, CEWD helped align industry competencies with the program curriculum.

CEWD also worked closely with the consortium leadership to provide technical assistance and guidance on development of the career pathways for the energy and mining industries. Specifically, they helped define the competency model and assisted Career Coaches by creating a coaching handbook and conducting monthly conference calls to discuss challenges and share best practices.

SFAz, a non-profit organization, facilitates STEM education opportunities across public, private, and nonprofit organizations as well as colleges and universities statewide. SFAz assisted with ASC-GIEC course articulation between the consortium colleges and was instrumental in developing a transfer path to ASU's engineering program. SFAz also provided the colleges with access to resources and programs to ensure students meet industry-established thresholds.

The partnerships with both the CEWD and SFAz were highly collaborative and promoted the sharing of information across systems. By virtue of their positions outside the community college system, these organizations helped the consortium maintain focus on the alignment of college programs and policies across the state, to better serve students by directly addressing industry needs.

3.3.4.3 Workforce Agencies

The contributions of workforce agencies were less evident. Workforce agencies, such as WIBs and AJCs, did not serve on the Industry Advisory Board nor have input on the implementation of the programs. However, during initial grant development, consortium members expected that local workforce partners would conduct program outreach and screen TAA-eligible, unemployed, displaced, and underemployed workers who might benefit from training. The success of this effort varied due to inconsistencies in the strength of the partnerships among WIBs, AJCs, and the colleges. For example, the Arizona Workforce Connection (AWC), which is the only workforce agency that serves both Navajo and Apache counties in northern Arizona, did not have a staff person focused on TAA-eligible workers and the ASC-GIEC program until January 2014. By April 2014, AWC had begun training caseworkers on the programs, displaying ASC-GIEC brochures, and planning coordinated recruitment activities with NPC – illustrating how long this relationship took to become established.

By contrast, PCC had a long-standing relationship with the local WIB and AJC, having already worked on multiple initiatives together. The Pima County WIB also had strong relationships with many of the community based organizations (CBOs) serving the same populations as the college. The WIB has weekly meetings with the AJCs and CBOs, often providing updates on the ASC-GIEC program at PCC. Representatives also attend all job fairs that PCC is associated with and help students complete applications for the ASC-GIEC programs. The AJC liaison to PCC met with the Tucson TAA coordinator at the Arizona Department of Economic Security (DES) during the first year of the ASC-GIEC grant to recruit the TAA-eligible population. However, DES was unable to share contact information for TAA recipients (employers) or eligible workers. This gap in individual contact information for TAA-eligible workers was the primary obstacle to recruiting them across the consortium.

Despite PCC's close partnership with the local workforce agencies, which was unique in the consortium, several non-PCC respondents noted that partnerships with workforce agencies were not as well developed as they could be. Many attributed this to the limited outreach by ASC-GIEC faculty and staff, as well as their lack of experience in fostering such relationships. Maintaining relationships with workforce partners is likely to be even more challenging post-grant, because several colleges have not identified staff to oversee this type of partnership.

3.3.4.4 Career Assessment Service Provider

Kuder, Inc., a for-profit multi-national company, provides tools for career assessment, education planning, and guidance resources. Its role in the ASC-GIEC program included creation of a student

database, access to online student assessment tools, and virtual tools to support student career coaching. While a Kuder representative was present at the first Industry Advisory Board meeting after contract award, Kuder has no ongoing participation in the consortium leadership. The relationship between Kuder and the colleges was more of a vendor-client rather than an active two-way partnership.

During the first year of its contract with the consortium, Kuder conducted several webinars with Career Coaches and appropriate staff, to provide an overview of its services and tools. These include:

- *Kuder Career Planning System (KCPS).* The KCPS software license agreement provides ASC-GIEC students with access to Journey, an online career planning system. The Journey assessment results provide career suggestions based on ASC-GIEC students' interests, skills, and values. The KCPS also includes an online administrative database management system (ADMS) that allows ASC-GIEC faculty and staff to access individual and aggregated student data.
- *Kuder Career Coach.* This is a virtual career coach and customer support tool subscription provided to ASC-GIEC students at a cost of $150 per student (paid for by the grant). The tool includes in-depth career assessment interpretation, career coaching by phone or online, and confidential support in setting and achieving career goals.
- *Kuder Connect to Business.* This website links businesses with students, to build relationships and create awareness surrounding employment opportunities. Businesses can post information about internships, apprenticeships, summer jobs, and full- or part-time employment.
- *Kuder Administrative Database Management System (ADMS).* The ADMS allows colleges to implement and manage their online career planning system through a virtual dashboard. It also allows staff to access real-time individual and aggregate student data.

The Career Coaches primarily used Kuder to administer program intake forms and assessments for credentials. College staff had mixed feelings about the usefulness of Kuder tools, which was reflected in their limited use of these tools.

The virtual Career Coach available through Kuder was never fully utilized by ASC-GIEC students, because Career Coaches saw it as duplicating the service they provided and did not, therefore, advocate its use. While the intent was that the virtual service would allow for sustainability of the career coaching services beyond the life of the grant, the virtual service has not become an integral part of the service delivery model at any of the colleges.

Similarly, the Career Coaches and Program Coordinators showed little awareness of the Kuder Connect to Business service. Kuder did not develop relationships with workforce development or employer partners, but instead left that role to the Career Coaches. Since none of the employer partners was even aware of this Kuder service, they did not use it to post job openings.

3.3.4.5 Summary of Successes and Challenges

A particular strength of the ASC-GIEC was intended to be its involvement with industry partners committed to a regional approach to workforce development in the energy and mining sector. Building on pre-existing relationships, the consortium was able to incorporate industry input from the beginning of the grant, which resulted in post-grant collaborations such as that between CGCC and SRP. While industry partnerships were critical to curriculum development, equipment procurement, and recruiting, their efforts did not always translate into timely information sharing regarding hiring projections – making it difficult for the colleges to recognize, and therefore make adjustments, to the lower than expected number of job openings available to program completers.

Relationships with workforce agencies varied substantially across colleges. PCC, for example, has very strong partnerships with its local WIB and AJCs. For example, PCC's workforce system actively markets the ASC-GIEC program to its customers and local employers and assists in enrollment at AJCs. But other colleges have had little success in building strong relationships with their local workforce systems, which plausibly has limited the recruitment of TAA-eligible and dislocated workers – the key target populations for TAACCCT grant programs.

3.3.5 Program Management, Funding, and Sustainability – What institutional management practices led to successful implementation of the project and allowed for sustainability?

This section examines program management and funding throughout the life of the grant, as well as sustainability plans.

3.3.5.1 Grant Management

To ensure timely completion of all milestones and deliverables associated with the award, EMCC, as the lead institution, hired a professional grant manager as Project Director. This individual was responsible for:

- Overseeing development and implementation of the grant work plan
- Securing the necessary contracts and MOUs with consortium partners
- Distributing grant funds to the colleges
- Processing DOL procurement requests
- Completing grant-reporting requirements

KEY FINDINGS

- The strong partnerships that characterized the program facilitated effective management and collaboration.
- Procurement requirements resulted in initial delays in hiring and obtaining equipment.
- While there is a desire to continue collaboration following the grant, it is unclear how many of these partnerships will be institutionalized.

Additionally, each college brought on a Project Coordinator who served as the main point of contact for the consortium and was responsible for coordinating college-level grant activities, procurement requests, and compliance with reporting requirements. In some cases, the Project Coordinator was a CTE administrator or faculty member funded partially through the grant. In other cases, the colleges hired someone specifically for the role.

Staffing. At the college-level, one of the initial challenges faced by Project Coordinators was hiring the necessary staff. By the time of our first site visit, most of the required MOUs and contracts were in place, allowing colleges to hire required staff and purchase program-training equipment. However, in some cases, the hiring of key program staff took longer than anticipated, causing implementation delays. For example, CGCC had difficulty hiring an EUT faculty member and Career Coach. As a result, the college experienced delays in course approval and curriculum development during Year 1. PCC was also waiting for pending EUT faculty hires to revise the corresponding curriculum during this time. Many respondents attributed this issue to the strict DOL guidelines on the hiring of faculty and staff, forcing some colleges to leave positions unfilled. Additionally, the unique set of skills needed for certain positions intensified the difficulty of finding qualified ASC-GIEC faculty.

Communication. Throughout ASC-GIEC program implementation, the Industry Advisory Board met quarterly to monitor progress on work plan tasks, discuss associated budget and reporting issues, facilitate committee work, set targets for the next quarter, and gather input from industry partners. In addition to these quarterly consortium meetings, monthly conference calls were scheduled for the leadership team (grant leadership, college CTE administrators, and key program staff), each Industry Advisory Board committee (Outreach & Communication, Workforce Planning, and Curriculum & Instruction), and the committee chairs. During Year 1, the consortium established monthly conference calls with the Career Coaches to support program implementation and share best practices. The Project Director also set up the shared Dropbox folder for the storage of consortium planning documents and reference materials.

College grant-funded staff and consortium partners unanimously reported that communication from the grant-funded staff was continuous, flexible, and useful. Many respondents also stated that they felt free to pick up the phone or email a question to their peers, the Public Relations Assistant, the Project Coordinator, or the Project Director as needed. A few respondents said they did express concerns about the lag in follow-up activities from the colleges and other consortium partners. To address these issues, grant-funded staff developed post-meeting communications that highlighted “important timelines and deadlines.”

3.3.5.2 Funding

The Project Director distributed grant funds to support the following:

- Equipment procurement
- Salaries for grant-funded staff

- Outreach and marketing materials
- Industry Advisory Board activities

In the early stage of implementation, there were significant delays associated with the procurement of essential training equipment. For example, it took EMCC 14 months to procure all of its equipment. Similarly, CGCC waited a year for the arrival of a truck it ordered, because of the time required for all necessary parties to sign off on the purchase. Many respondents attributed these delays to DOL's slow and complex equipment procurement process. For example, some respondents were unaware that they needed approval from DOL prior to purchasing necessary training equipment and course materials. This forced some colleges, which had purchased expensive equipment without approval, to wait months for DOL consent and reimbursement. These funding delays caused staff to become hesitant when purchasing equipment, resulting in a much slower procurement of essential training equipment and course materials.

Additionally, a DOL audit during that time confirmed that the consortium had underspent their initial budget projections – primarily due to the slow hiring and equipment procurement discussed above, as well as to lower-than-expected student enrollment. However, by the end of Year 2, as the colleges moved toward full program implementation, spending approached original projections, and most equipment procurement was complete.

3.3.5.3 Sustainability

Funding from the ASC-GIEC TAACCCT grant was intended to cover the upfront costs of expanding classroom space and training equipment, developing a shared curriculum, implementing student support services, and developing internship and apprenticeship agreements. Following the end of the grant, it was expected that colleges would cover the program's ongoing operational costs through student enrollment.

When grant funding ends, all positions associated with grant management will be discontinued. At some colleges, however, other individuals will assume the responsibilities associated with these positions. For example, PCC will appoint an ASC-GIEC faculty member as Program Manager, to help maintain contact between the ASC-GIEC program and employer partners. It is not clear that this type of role will exist so clearly at other colleges, which may lead to divergences in program sustainability and result in some colleges not having the staffing available for positions that were grant-funded and dedicated to carrying out these tasks. If, as a result, these management functions are added to staff and faculty's existing responsibilities, they may be neglected through lack of available time.

Most of the colleges plan to sustain faculty positions created through the grant by leveraging college enrollment funds. However, it is unclear whether all will be able to achieve high enough student enrollment to provide sufficient financial support for such positions. This is a particular challenge at the more rural campuses, where there is a smaller pool of potential students. For

example, the Mechatronics program at NPC may have difficulties recruiting enough students to sustain the instructor and lab technician positions at current levels. At the time of our final site visit to NPC, it was still negotiating the budget and these positions were not yet secure.

Two colleges will maintain the role of the Career Coach but expand it to serve all CTE students. Students at the remaining colleges will be referred to the general student services offices for career planning assistance. Both students and staff expressed concern that, because Career Coaches will be serving students across the college, future students in the ASC-GIEC program will not benefit from the same depth of services as available from the dedicated Career Coach under the grant. Career Coaches also noted that the TAACCCT grant fostered collaboration with their colleagues at the other consortium colleges through monthly conference calls. While all Career Coaches expressed an interest in maintaining contact with their peers, even as their roles are reconfigured, no mechanism is currently in place to support their ongoing collaboration beyond the life of the grant.

The Marketing and Outreach committee began considering the sustainability of recruitment efforts from Year 1 onward. They expected that, after the grant expired, the colleges would each take full responsibility for marketing and recruitment for their respective programs. The logo, website, and templates for other materials designed through the grant will be available for the colleges to use going forward and can be updated as needed. The Maricopa Community College District has agreed to host the ASC-GIEC website with links to the college pages. Individual colleges will be responsible for updating the information on their local websites. Continued participation in job fairs and the planning of open houses will depend on the efforts of the colleges themselves, but faculty at all colleges expressed an interest in continuing these activities.

To sustain industry involvement, the consortium revived the AEWC, which will now include all five colleges as well as the energy and mining employers and other consortium partners. Employer partners expect to continue their advisory relationship with the colleges and to invest in future revisions to the curriculum and upgrades to the program equipment. At the final ASC-GIEC Industry Advisory Board meeting, attendees agreed that the AEWC would meet twice a year going forward. It remains to be seen how effective the group will be without the institutionalized support of the TAACCCT grant.

3.3.5.4 Summary of Successes and Challenges

The consortium successfully managed the ASC-GIEC program from initial implementation to the beginning of grant closeouts. Program staff hosted regular meetings with relevant stakeholders to discuss milestones, upcoming deliverables, and lessons learned. Staff also posted program information to the ASC-GIEC DropBox website. This allowed for open communication across the consortium, which was helpful throughout the life of the program but particularly during initial program implementation. Respondents across the consortium also consistently mentioned that they were able to “pick up the phone and call [program staff or other colleges]” if they had a question.

Only at the end of the grant did ASC-GIEC stakeholders switch their focus from developing and managing program operations to sustaining the program beyond the life of the grant. While the AEWC will provide a forum for continuing activities fostered under the grant, sustainability of the consortium could have been more deeply institutionalized had planning begun earlier. It was also apparent in our interviews that stakeholders would like to continue collaboration but were uncertain of the mechanisms for doing so.

3.3.6 Promising Practices and Lessons Learned

Based on the findings for each of the research questions presented in Section 3.1, we have identified promising practices and lessons learned in the implementation of the ASC-GIEC program, as summarized below.

3.3.6.1 Promising Practices

Implementation of the ASC-GIEC TAACCCT grant highlighted several promising practices that can inform program improvement at the participating colleges and similar future efforts.

Grant management and organizational structure supported collaboration across colleges and industry partners. EMCC, as lead institution on the grant, hired a Project Director with several years of grant management experience. The Project Director effectively oversaw the distribution of grant funds, monitored procurement and spending, and fulfilled the DOL reporting requirements. Through the Industry Advisory Board and its committee structure, grant leadership was also able to foster college and industry buy-in through a professional culture of shared benefit and responsibility. Thus, when implementation challenges arose, the consortium was able to work as a collaborative body to focus on solutions and deter any major threats to the project as a whole.

The consortium successfully leveraged existing relationships with employers to develop industry-relevant career pathways. The consortium colleges created new and updated certificate and degree programs that included formal articulation among the consortium colleges, as well as a transfer pathway to ASU's Fulton School of Engineering. The certificate and degree programs were designed, with input from industry partners in the Arizona energy and mining sector, to address the aging of the current workforce by creating on-ramps to high wage careers in those sectors. Industry partners – such as APS, TEP, SRP and Freeport Mines – also participated in creating and improving work-based learning and internship opportunities that qualify applicants for apprenticeship programs with those employers, as well as other opportunities in the energy and mining sector. These partnerships served as models for other employers, such as Southwest Gas, to emulate.

The program improved preparation for jobs in the energy and mining sector. Implementation of the eight-tier competency model produced a well-defined set of skills, knowledge, and dispositions valued by employers in the energy and mining sectors. Adoption of this model

supported development of aligned curriculum to address those competencies at the community college level.

The colleges incorporated relevant state-of-the-art tools, equipment, and technology into ASC-GIEC programs. The colleges leveraged advice from employer partners and grant funds to provide students with hands-on learning with equipment similar to what they would find on the job. Faculty, students, and employers alike considered the updating of the technical training facilities and equipment as a major achievement that would not have been possible without the TAACCCT grant funding.

Consortium stakeholders responded to deterioration of the economic climate by reaching out to new employer partners. Unfortunately, hiring in the energy and mining sector did not meet the expectations of the ASC-GIEC. In response to this change in the economy, consortium colleges actively sought to identify and engage new employer partners in the consortium. Many employers in the construction, advanced manufacturing, and commercial distribution sectors need workers with technical skills and competencies similar to those valued in the energy and mining sector. By fostering relationships with employers in related sectors, the consortium has taken the first steps toward buffering the communities served by the ASC-GIEC programs from future instability in the energy and mining sector.

3.3.6.2 Lessons Learned

This section highlights lessons learned in implementing the core strategies of the grant as identified through our site visits, attendance at quarterly meetings, participant survey, and project document review.

Engage local workforce development partners early in the process. Establishing effective partnerships with the workforce development system was challenging for the colleges. More active engagement with WIBs and AJCs early in implementation could have helped realize the full potential of the partnerships by promoting buy-in from the stakeholders in those agencies, thereby facilitating marketing, outreach, and job placement efforts. Including workforce partners as active members of the Industry Advisory Board from program inception might have been particularly productive.

Employment opportunities for ASC-GIEC graduates remain limited. Employers continue to plan for baby boomer retirement; however, industry retirement numbers remain low. As a result, employment opportunities for recent ASC-GIEC graduates with industry partners are still limited. This was a point of contention for ASC-GIEC student focus group participants, who felt they had been misled by program assurances that such jobs would be available upon program completion. The situation was exacerbated because the consortium, despite generally strong relationships between consortium colleges and industry partners, has found it difficult to obtain accurate hiring projections from industry.

Plan for sustainability of mechanisms supporting collaboration. While the consortium planned for the sustainability of some program components, it did not plan for the sustainability of the management structures that supported collaboration between colleges and industry partners. Future DOL grant opportunities focused on career pathway development might do well to require sustainability planning, not only for program elements, but also the organizational mechanisms that support effective collaboration among industry, workforce development, and educational institutions.

4. OUTCOMES ASSESSMENT STUDY

4.1 Study Objectives

The objective of this study is to examine the characteristics and educational outcomes of individuals who participated in the ASC-GIEC program during the study period. We also compare these outcomes with those of students at the consortium colleges who are enrolled in other CTE programs (termed 'the other CTE students' in this report). Using data provided by the five consortium colleges, the outcomes study addresses the following questions:

- What are the demographic characteristics of ASC-GIEC study participants (gender, race/ethnicity, age, education, etc.)?
- Do ASC-GIEC study participants differ in their demographic characteristics from students enrolled in other CTE programs in the consortium colleges and from Arizona labor force participants (overall and in energy-related sectors)?
- What were the educational outcomes of ASC-GIEC participants (completed tier 1-3 training; completed tier 4-5 training; NCRC, EIF certificate attainment; and program completion)?
- What student characteristics are associated with desirable educational outcomes?
- How do the educational achievements of ASC-GIEC participants compare with those of the other CTE students?

In the remainder of this section, we first describe the data and methodology used to address these questions. We then present descriptive analyses of the characteristics of ASC-GIEC participants, comparing them to the characteristics the other CTE students and Arizona labor force participants statewide. We follow this with a description of the educational outcomes of ASC-GIEC participants and multivariate regression analyses to examine variation in those outcomes based on individual characteristics. Finally, we compare educational outcomes between ASC-GIEC participants and the other CTE students, using regression models that control for individual characteristics that may be related to differences in outcomes.

4.2 Data and Methodology

In this section, we describe the data sources and methods for answering the research questions outlined above.

4.2.1 Data Overview

Our analyses rely primarily on Student Information System (SIS) data provided by the consortium colleges. These data provide information on ASC-GIEC participants, that is, students who were enrolled in the consortium colleges in at least one semester from Fall 2012 or later, signed the ASC-GIEC intake consent form, and were at least 18 years old. The data also provide information on the other CTE students. These data include the following information:

- *Characteristics:* including gender, race/ethnicity, education, age, and Veteran status.
- *College Enrollment:* including semester of enrollment and degree/program goals.
- *Education Outcomes:* including completion of classes associated with tiers 1-3 and 4-6 (ASC-GIEC participants only) and program completion.

We supplement the SIS data with program documentation from the colleges that provided information about which ASC-GIEC students completed the program credentials (including the NCRC and EIF). These data are also combined with transfer information from the National Student Clearinghouse (NSC), which provides information about transfers to college degree programs, and the ASC-GIEC program intake form, which identifies students who were TAA-eligible at the time of program enrollment.

4.2.2 Analysis Plan

To address the key research questions, we analyze available characteristics and outcomes of ASC-GIEC study participants and the other CTE students during the study period. First, using information provided in the college data, we present descriptive analyses of the characteristics of ASC-GIEC study participants, including gender, race, ethnicity, and education. Comparisons with the characteristics of the other CTE students enable us to assess the extent to which the average ASC-GIEC participant differs from those in other skilled trade–oriented programs.

In addition, we tabulated the 2013 American Community Survey (ACS) data to produce the distribution of characteristics of Arizona labor force participants statewide. We provide this information for all labor force participants and those in energy-related sectors, such as manufacturing, construction, and utilities. Comparisons between ASC-GIEC participants (based on college data) and Arizona labor force participants (based on ACS data) show whether the program attracted participants with similar characteristics to those of labor force participants in sectors that have energy-related jobs. Finally, we used NSC data to examine frequency of transfer to four-year institutions among program participants compared to the other CTE students.

Using SIS and NSC data, we constructed educational outcomes for ASC-GIEC study participants (Exhibit 23).

Exhibit 23. Educational Outcomes for ASC-GIEC Study Participants

Research Topic	Primary Questions
Foundational Course Completion	▪ Career Readiness Course: Whether the participant took the career readiness course (CPD 104 or equivalent). ▪ Industry Fundamentals Course: Whether the participant took the industry fundamentals course (PPT 120, NRG 101, or equivalent).
Credential Completion	▪ NCRC: Whether the participant obtained the National Career Readiness Certificate (NCRC).[12] ▪ EIF: Whether the participant obtained the Energy Industry Fundamentals (EIF) certificate.
Tier Completion	▪ Completed tier 1-3: Whether the participant took the career readiness course and obtained the NCRC. ▪ Completed tier 4-5: Whether the participant took the industry fundamentals course and obtained the EIF. ▪ Completed tier 1-3 and tier 4-5: Whether the participant took both tier 1-3 and tier 4-5 training.
Program Completion	▪ Whether the participant completed program requirements and received the program degree/certificate (tier 6-8 for ASC-GIEC participants).
Transfer	▪ Whether the participant transferred to a four-year institution.

We present descriptive analyses of these outcomes to assess whether participants were successful in achieving their program goals. We present analyses for the entire participant population and by participating college to identify variation in outcomes across the five consortium colleges. To assess whether observed outcomes varied based on individual characteristics and the college of enrollment, we use the following regression model:

$$Y = \alpha + X \cdot \beta + Sem \cdot \gamma + College \cdot \delta + Sem \cdot College \cdot \varepsilon + P \cdot \zeta + u \qquad (1)$$

In this model (model 1), the dependent variable (Y) is the educational outcome of interest and control variables include: X, indicators for individual characteristics (gender, race, age, Veteran status, TAA status, etc.); Sem, indicators for the first semester of enrollment in the college; $College$, indicators for the college in which the participant was enrolled; $Sem \cdot College$, interactions between semester and college indicators; P, indicators for the program of study; and u, a zero-mean disturbance term. The *Sem*, *College*, and *P* indicators are included to remove any variation in outcomes related to the timing of program enrollment, college characteristics, and program of study. The parameters of interest are in the vector β, which measures differences in average outcomes across individual characteristics. This model is estimated using the population of ASC-GIEC study participants and separately for each outcome. T-tests are used to infer the statistical significance of individual parameters, which is important for establishing which characteristics are associated with improved outcomes. These analyses will help disentangle the relationship between outcomes and individual characteristics, and provide a more accurate characterization of the types of participants likely to have improved outcomes based on individual characteristics and college of enrollment.

[12] Data for the EEC certificate was unavailable and was therefore not included in the analysis.

Finally, we compare the common educational achievements between ASC-GIEC study participants and the other CTE students. Since outcomes related to foundational course participation, credential completion, and tier training are specific to the ASC-GIEC program, these cannot be examined for the CTE group. However, we can examine differences between ASC-GIEC participants and the other CTE students in program completion outcomes – namely, whether students completed their program and whether students transferred to a four-year institution. In addition to descriptive analyses, we estimate multivariate regression models, which assess whether ASC-GIEC participants achieved similar, improved, or lower outcomes compared with the other CTE students, controlling for individual characteristics, semester of enrollment, and college. The model used here (model 2) has a similar structure as model 1, with the addition of an indicator for whether the individual was an ASC-GIEC participant:

$$Y = \alpha + T \cdot \theta + X \cdot \beta + Sem \cdot \gamma + College \cdot \delta + Sem \cdot College \cdot \varepsilon + P \cdot \zeta + u \qquad (2)$$

In this model, T is an indicator that equals 1 if the student was an ASC-GIEC participant and 0 if s/he was not. The remaining control variables are the same as in model 1. Model 2 is estimated using the population of ASC-GIEC participants and the other CTE students. Of particular interest is the parameter θ, which measures outcome differences between ASC-GIEC participants and the other CTE students, controlling for individual characteristics. We use T-tests to determine if this parameter is statistically significant – that is, to assess if there are any reliably measurable differences in outcomes between ASC-GIEC participants and the other CTE students.

4.2.3 Program Impacts

The results of the outcomes assessment study provide insights into the profile of ASC-GIEC participants and the extent to which it differs from the profile of other students enrolled in CTE programs at the consortium colleges, as well as from that of labor force participants statewide. Moreover, analyses of participant outcomes show whether they were able to achieve their educational objectives – completing tier training, earning certificates, and furthering their education – and identify the types of participants who were more likely to succeed. Finally, outcomes comparisons between the ASC-GIEC program and other the CTE programs in the consortium colleges are useful for assessing whether the outcomes of ASC-GIEC participants are similar, improved, or lower than those of the other CTE students.

However, the results of this study cannot be used to infer the impact of the ASC-GIEC program or if it is more effective than other programs offered by the consortium college. The reason is that ASC-GIEC participants have different education and career objectives than those who enrolled in other college CTE programs. For example, the average ASC-GIEC participant is likely to differ, in both observed and unobserved factors, from the average student enrolled in nursing, culinary arts, or other programs that focus on occupations that are substantively different from those in the energy sector. Thus, any differences in outcomes between ASC-GIEC participants and students in the other CTE programs reflect both the impacts of the ASC-GIEC program and underlying participant/non-participant differences in characteristics and career objectives.

In the initial stages of this project, IMPAQ proposed the use of a quasi-experimental study to estimate the impacts of the ASC-GIEC program relative to other education/training options available in the community – including programs offered by the consortium colleges and WIA training offered by the state of Arizona. Our proposed study involved the use of matching methods enabling us to estimate ASC-GIEC program impacts by comparing the outcomes of ASC-GIEC participants to those of similar individuals in two comparison groups:

1. Students not enrolled in the ASC-GIEC program but enrolled in two-year programs offered by the consortium colleges focusing on the energy or a closely related sector (e.g., manufacturing and technology); and
2. Individuals not enrolled in the consortium colleges but enrolled in Arizona state WIA training programs.[13]

Unfortunately, implementing this design was not feasible, despite our best efforts. First, after a careful review of the programs offered by the consortium colleges, we were unable to identify programs that had both a similar focus industry or required similar coursework as the ASC-GIEC program and a sufficient number of students for matching. Across colleges, these programs were absorbed into the ASC-GIEC program. As a result, constructing comparison group 1 was not feasible. Second, after extensive discussions with Arizona state agencies, neither IMPAQ nor the individual community colleges were able to secure a data sharing agreement that would allow us to access the state administrative data required to construct comparison group 2. Nevertheless, subject to the limitations noted above, the outcomes assessment study is a useful tool for helping assess the overall effectiveness of the ASC-GIEC program.

4.3 Program Participants

The overall total of ASC-GIEC participants plus the other CTE students enrolled across the study period was 51,920; of these 1,214 were enrolled in the ASC-GIEC program (Exhibit 24). The number of ASC-GIEC participants across colleges ranged from 208 at NPC to 272 at CGCC. Almost half of the 50,706 other CTE students was enrolled at PCC[14]; the smallest share was enrolled at CGCC.

Exhibit 24. Number of Students, Total and by College

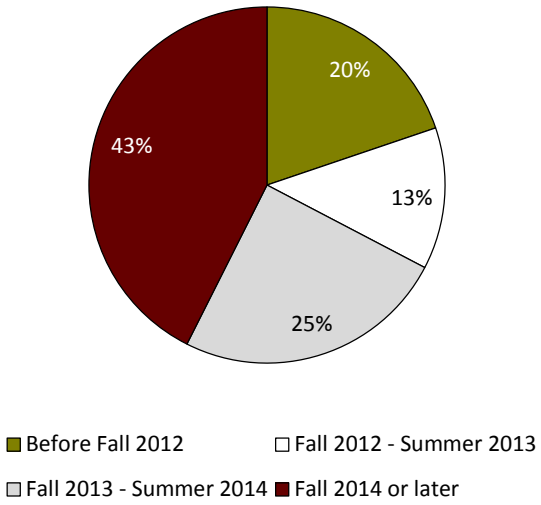
School	EMCC	CGCC	NPC	PCC	YC	Combined
Total	**6,257**	**3,658**	**9,290**	**23,872**	**8,843**	**51,920**
ASC-GIEC Participants	261	272	208	236	237	1,214
Student in Other CTE Programs	5,996	3,386	9,082	23,636	8,606	50,706

[13] A detailed discussion of IMPAQ's proposed quasi-experimental study is available in the Evaluation Design Report, submitted in July 2013.

[14] The large number of PCC non-participants is because, relative to other consortium colleges, PCC is bigger in size, provided more emphasis on CTE and occupational programs, and had the most extensive list of such programs.

About a fifth of ASC-GIEC study participants first enrolled in consortium colleges before the Fall 2012 semester (Exhibit 25). Program participation increased slightly in the subsequent year, but slightly over two-thirds of ASC-GIEC study participants enrolled in the consortium colleges in Fall 2013 or later. At this point, many of the program components had been implemented, suggesting a majority of students had the opportunity to take advantage of the full array of ASC-GIEC components.

Exhibit 25. Start of College Enrollment among ASC-GIEC Study Participants



The distribution of study participants across declared ASC-GIEC programs, as reflected in the SIS data, differed by college – with Power Plant Technology most common at EMCC, Electrical Utility Technology at CGCC, Welding at NPC and YC, and Building and Construction at PCC (Exhibit 26). Those classified as in a non-GIE program or undeclared likely had yet to change their major to an ASC-GIEC degree.

Exhibit 26. Degree Declared by ASC-GIEC Study Participants

ASC-GIEC Degree by College	Number of Participants
EMCC	**261**
Power Plant Technology	73% *(N = 190)*
IT Security	<1% *(N = 1)*
Non-GIE Program	26% *(N = 68)*
Undeclared	<1% *(N = 2)*
CGCC	**272**
Electrical Utility Technology	43% *(N = 118)*
Engineering Technology	17% *(N = 47)*
Non-GIE Program	39% *(N = 105)*
Undeclared	<1% *(N =2)*
NPC	**208**
Industrial Maintenance Operation	25% *(N = 53)*
Mechatronics	4% *(N = 8)*
Welding	44% *(N = 91)*
Non-GIE Program	27% *(N = 56)*
PCC	**236**
Building and Construction	53% *(N = 126)*
Non-GIE Program	47% *(N = 110)*
YC	**237**
Electrical Instrumentation	28% *(N = 67)*
Electrical Utility Technology	15% *(N = 35)*
Welding	47% *(N = 111)*
Pre-Engineering	5% *(N = 13)*
Non-GIE Program	5% *(N = 11)*

Note: Reported is the sample proportion with number of participants in parentheses.

4.3.1 ASC-GIEC Study Participant Characteristics

Examining the demographic and socioeconomic background of ASC-GIEC participants provides insight into the kinds of students the program serves. In this outcomes study, we identified the following characteristics at enrollment:

- Gender
- Race and ethnicity
- Age
- Prior education
- Veteran status
- TAA eligibility

KEY FINDINGS

- The vast majority of participants were male.
- ASC-GIEC participants were younger than the average TAA-eligible worker.
- With the exception of CGCC, consortium colleges recruited relatively few TAA-eligible individuals.

Almost nine out of 10 ASC-GIEC participants were men (Exhibit 27). The gender distribution was similar across colleges, documenting that the program was substantially more effective in attracting men than women. This confirms the finding from our implementation study that, throughout the grant period, colleges struggled to enroll women in the program. However, the share of women did increase slightly over the grant period. At the time of our interim report, only 6 percent of study participants were female; in the final population, this had increased to 10 percent – which plausibly reflects the more effectively targeted efforts by the consortium to increase its female population later in the grant period.

Exhibit 27. Characteristics of ASC-GIEC Participants

School	EMCC	CGCC	NPC	PCC	YC	Combined
Total N	**261**	**272**	**208**	**236**	**237**	**1,214**
Gender						
Female	13% *(N = 35)*	12% *(N = 32)*	10% *(N = 21)*	6% *(N = 13)*	7% (N = 16)	**10% (N = 117)**
Male	87% *(N = 226)*	88% *(N = 239)*	90% *(N = 187)*	89% *(N = 209)*	93% *(N = 220)*	**89% *(N = 1,081)***
Missing	0% *(N = 0)*	<1% *(N = 1)*	0% *(N = 0)*	6% *(N = 14)*	<1% *(N =1)*	**<1% *(N = 16)***
Race/Ethnicity†						
White	60% *(N = 156)*	54% *(N = 148)*	58% *(N = 120)*	30% *(N = 70)*	32% *(N = 75)*	**47% *(N = 569)***
African American	5% *(N = 14)*	4% *(N = 10)*	<1% *(N = 1)*	4% *(N = 10)*	<1% *(N = 1)*	**3% *(N = 36)***
Hispanic	29% (N = 75)	19% *(N = 53)*	9% *(N = 19)*	58% *(N = 138)*	12% *(N = 28)*	**26% *(N = 313)***
American Indian	1% *(N = 3)*	2% *(N = 5)*	25% *(N = 53)*	1% *(N = 2)*	3% *(N = 7)*	**6% *(N = 70)***
Other	2% *(N = 5)*	7% *(N = 20)*	7% *(N = 15)*	3% *(N = 8)*	53% *(N = 126)*	**14% *(N = 174)***
Missing	3% *(N = 8)*	13% *(N = 36)*	0% *(N = 0)*	3% *(N = 8)*	0% *(N = 0)*	**4% *(N = 52)***
Age						
18-19 Years	37% *(N = 96)*	38% *(N = 102)*	28% *(N = 59)*	30% *(N = 71)*	55% *(N = 130)*	**38% *(N = 458)***
20-24 Years	18% *(N = 46)*	29% *(N = 79)*	20% *(N = 41)*	25% *(N = 60)*	10% *(N = 24)*	**21% *(N = 250)***
25-29 Years	18% *(N = 48)*	17% *(N = 46)*	15% *(N = 32)*	15% *(N = 35)*	13% *(N = 31)*	**16% *(N = 192)***
30-39 Years	20% *(N = 52)*	11% *(N = 29)*	23% *(N = 48)*	21% *(N = 50)*	14% *(N = 34)*	**18% *(N = 213)***
40+ Years	7% *(N = 19)*	5% *(N = 13)*	13% *(N = 28)*	8% *(N = 20)*	7% *(N = 17)*	**8% *(N = 97)***
Missing	0% *(N = 0)*	1% *(N = 3)*	0% *(N = 0)*	0% *(N = 0)*	<1% *(N = 1)*	**<1% *(N = 4)***
Education						
High School	41% *(N = 108)*	43% *(N = 118)*	0% *(N = 0)*	35% *(N = 83)*	4% *(N = 9)*	**26% *(N = 318)***
Some College	38% *(N = 100)*	39% *(N = 105)*	0% *(N = 0)*	54% *(N = 128)*	18% *(N = 43)*	**31% *(N = 376)***
Associate Degree	7% *(N = 18)*	5% *(N = 13)*	0% *(N = 0)*	8% *(N = 18)*	7% *(N = 17)*	**5% *(N = 66)***
College Degree	7% *(N = 17)*	3% *(N = 9)*	0% *(N = 0)*	3% *(N = 7)*	0% *(N = 0)*	**3% *(N = 33)***
Missing	7% *(N = 18)*	10% *(N = 27)*	100% *(N = 208)*	0% *(N = 0)*	71% *(N = 168)*	**35% (N = 421)**

School	EMCC	CGCC	NPC	PCC	YC	Combined
Total N	**261**	**272**	**208**	**236**	**237**	**1,214**
Veteran Status						
Veteran	15% *(N = 39)*	9% *(N = 24)*	7% *(N = 15)*	6% *(N = 13)*	6% *(N = 14)*	**9% *(N = 105)***
Non-Veteran	85% *(N = 222)*	91% *(N = 247)*	93% *(N = 193)*	94% *(N = 223)*	94% *(N = 223)*	**91% *(N = 1,108)***
Missing	0% *(N = 0)*	<1% *(N = 1)*	0% *(N = 0)*	0% *(N = 0)*	0% *(N = 0)*	**<1% *(N = 1)***
TAA Eligibility						
TAA-Eligible	2% *(N = 6)*	34% *(N = 92)*	4% *(N = 9)*	2% *(N = 5)*	1% *(N = 2)*	**9% *(N = 114)***
Non-Eligible	97% *(N = 254)*	66% *(N = 180)*	45% *(N = 94)*	52% *(N = 122)*	99% *(N = 235)*	**73% *(N = 885)***
Missing	<1% *(N = 1)*	0% *(N = 0)*	50% *(N = 105)*	46% *(N = 109)*	0% *(N = 0)*	**18% *(N = 215)***

Note: Reported is the percentage of the total N with number of participants in parentheses.
†= In all colleges except YC, students self-report if they are white, African American, Hispanic, American Indian, or other race (includes multiple races). At YC, students self-report race (white, African American, American Indian, and other race) and ethnicity (Hispanic or non-Hispanic) separately; for consistency, the YC variables are combined.

Overall, the ASC-GIEC program attracted a racially and ethnically diverse student population. Among participants, almost 47 percent identified as white and 26 percent as Hispanic. An additional 3 percent identified as African American and 6 percent as American Indian. Compared to the state overall, this population slightly under-represents Hispanics (30.1 percent statewide) and African Americans (4.2 percent statewide) and slightly over-represents American Indians (4.4 percent statewide).[15] There were important racial and ethnic differences across colleges. While more than half the participants at EMCC, CGCC, and NPC identified as white, less than a third of participants at YC and PCC did so. PCC had a substantially higher proportion of Hispanics than the other four colleges, while YC and NPC had much lower than average proportions of Hispanics, and much higher proportions of American Indians and other race categories, respectively. This variation by college closely reflects demographic differences in the communities they serve.

A primary goal of the TAACCCT grant program is to retrain TAA-eligible and displaced workers. This population tends to be older than those entering college directly out of high school. For example, the average age of TAA-eligible workers is 45.6.[16] Therefore, we would expect the population served by the ASC-GIEC program to include a high percentage of students in this age range. Among ASC-GIEC participants, however, the majority of students were younger than 25 years of age – 38 percent were 18-19 years old and 21 percent were 20-24 years old. Only about 8 percent were at least 40 years old. The age distribution across colleges was similar, with the exception of YC, where over half the ASC-GIEC participants were 18-19 years old.

[15] U.S. Census Bureau, 2010-2014 American Community Survey 5-Year Estimates.
[16] Dolfin, Sarah and Jillian Berk. 2001. "National Evaluation of the Trade Adjustment Assistance Program: Characteristics of Workers Eligible Under the 2002 TAA Program and their Early Experiences."

Information on prior educational attainment was less precise, because it was missing for 421 (35 percent) participants. This is mainly because education was not reported for any NPC participants or for 71 percent of YC participants. Using available data, we see that the vast majority of participants had no more than a high school diploma or had attended some college with no degree. The age and education figures suggest that the ASC-GIEC program attracted primarily younger individuals with no or some college education.

As noted previously, an important goal of the ASC-GIEC program and TAACCCT grants in general is to provide training to TAA-eligible and dislocated workers. According to data on the ASC-GIEC intake form, the overall share of participants who were TAA-eligible was 9 percent. This is somewhat misleading, however, because all the colleges except CGCC had TAA-eligible student shares of under 5 percent. As noted in the implementation study, in the absence of the expected number of TAA-eligible participants, colleges shifted their focus to recruiting Veterans. As shown, nine percent of participants were Veterans, this matches the 9 percent Veteran share of the Arizona population.[17] EMCC had the highest proportion of Veterans at 15 percent. These figures suggest that the program was somewhat effective in attracting Veterans but, with the exception of CGCC, colleges have enrolled very few TAA-eligible workers.

4.3.2 Comparisons with the Other CTE Students

We compared ASC-GIEC participants with students in other CTE programs across the consortium[18] to assess how ASC-GIEC participants might differ from students in other trade-oriented disciplines (Exhibit 28). Comparing the characteristics distribution of ASC-GIEC study participants (Exhibit 27) with that of the other CTE students (Exhibit 28) reveals important differences.

KEY FINDINGS

- Students in other CTE programs were substantially more likely to be female.
- ASC-GIEC participants tended to be younger than students in other CTE programs.
- Overall, ASC-GIEC participants were slightly more likely to be Veterans than their counterparts in other CTE programs.

When compared with the ASC-GIEC participants, a substantially larger portion of the other CTE students were female (54 percent). ASC-GIEC participants were also much more likely to be under the age of 25 (59 percent) compared with the other CTE students (45 percent). Thus, overall the ASC-GIEC program attracted a disproportionally high number of male students and a disproportionally high number of younger students. While the gender patterns were consistent across all five consortium colleges, the age patterns differed. For example, at YC, the proportion of ASC-GIEC participants in the 18-19 age category (55 percent) greatly exceeded the proportion of the other CTE students (23 percent) in this age group. The differences were not as pronounced at the other colleges.

[17] U.S. Census Bureau, 2014 American Community Survey 1-Year Estimates

[18] Each college had a different list of programs they consider CTE. In an effort to standardize this across colleges, we compiled a comprehensive list of CTE programs from each college's course catalog and compiled a master list of CTE programs. If a program was considered CTE at any school, it was classified as CTE at all schools.

Race and ethnicity differed slightly between ASC-GIEC participants and the other CTE students. In particular, ASC-GIEC participants were slightly more likely to be white than other CTE students (47 percent vs. 44 percent) and slightly less likely to be Hispanic (26 percent vs. 28 percent). These differences were to a great extent driven by EMCC, however, where the proportion of white ASC-GIEC participants (60 percent) much exceeded the proportion of white students among the other CTE students at EMCC (37 percent). EMCC also saw a substantially smaller portion of Hispanic students among its ASC-GIEC participants (29 percent) compared to the other CTE students at EMCC (42 percent). In comparison, PCC saw a disproportionately high number of Hispanics among ASC-GIEC participants (58 percent) compared to the other CTE students at PCC (37 percent).

Exhibit 28. Characteristics of Other CTE Program Participants

School	EMCC	CGCC	NPC	PCC	YC	Combined
Total N	**5,996**	**3,386**	**9,082**	**23,636**	**8,606**	**50,706**
Gender						
Female	62% *(N = 3,692)*	62% *(N = 2,089)*	65% *(N = 5,880)*	46% *(N = 10,955)*	56% *(N = 4,777)*	**54% *(N = 27,393)***
Male	37% *(N = 2,230)*	35% *(N = 1,192)*	35% *(N = 3,196)*	50% *(N = 11,812)*	44% *(N = 3,817)*	**44% *(N = 22,247)***
Missing	1% *(N = 74)*	3% *(N = 105)*	<1% *(N = 6)*	4% *(N = 869)*	<1% *(N = 12)*	**2% *(N = 1,066)***
Race/Ethnicity†						
White	37% *(N = 2,200)*	54% *(N = 1,827)*	50% *(N = 4,530)*	44% *(N = 10,468)*	37% *(N = 3,206)*	**44% *(N = 22,231)***
African American	12% *(N = 698)*	7% *(N = 230)*	3% *(N = 228)*	5% *(N = 1,163)*	1% *(N = 125)*	**5% *(N = 2,444)***
Hispanic	42% *(N = 2,501)*	20% *(N = 692)*	10% *(N = 876)*	37% *(N = 8,773)*	14% *(N = 1,210)*	**28% *(N = 14,052)***
American Indian	2% *(N = 106)*	2% *(N = 61)*	20% *(N = 1,861)*	3% *(N = 652)*	3% *(N = 242)*	**6% *(N = 2,922)***
Other	4% *(N = 269)*	11% *(N = 357)*	17% *(N = 1,587)*	11% *(N = 2,580)*	44% *(N = 3,823)*	**17% *(N = 8,616)***
Missing	4% *(N = 222)*	6% *(N = 219)*	0% *(N = 0)*	0% *(N = 0)*	0% *(N = 0)*	**1% *(N = 441)***
Age						
18-19 Years	34% *(N = 2,014)*	26% *(N = 896)*	23% *(N = 2,076)*	19% *(N = 4,579)*	23% *(N = 1,988)*	**23% *(N = 11,553)***
20-24 Years	20% *(N = 1,208)*	25% *(N = 838)*	17% *(N = 1,547)*	24% *(N = 5,752)*	22% *(N = 1,889)*	**22% *(N = 11,234)***
25-29 Years	15% *(N = 884)*	15% *(N = 511)*	21% *(N = 1,870)*	16% *(N = 3,874)*	16% *(N = 1,364)*	**17% *(N = 8,503)***
30-39 Years	20% *(N = 1,171)*	19% *(N = 649)*	20% *(N = 1,820)*	20% *(N = 4,686)*	18% *(N = 1,578)*	**20% *(N = 9,904)***
40+ Years	12% *(N = 719)*	12% *(N = 399)*	19% *(N = 1,766)*	20% *(N = 4,738)*	21% *(N = 1,787)*	**19% *(N = 9,409)***
Missing	0% *(N = 0)*	3% *(N = 93)*	<1% *(N = 3)*	<1% *(N = 7)*	0% *(N = 0)*	**0% *(N = 103)***
Education						
High School	29% *(N = 1,741)*	29% *(N = 987)*	N/A	47% *(N = 11,086)*	5% *(N = 437)*	**28% *(N = 14,251)***
Some College	39% *(N = 2,342)*	44% *(N = 1,499)*	N/A	9% *(N = 2,127)*	15% *(N = 1,319)*	**14% *(N = 7,287)***
Associate Degree	4% *(N = 242)*	5% *(N = 172)*	N/A	2% *(N = 474)*	13% *(N = 1,095)*	**4% *(N = 1,983)***
College Degree	6% *(N = 352)*	9% *(N = 295)*	N/A	5% *(N = 1,160)*	1% *(N = 46)*	**4% *(N = 1,853)***
Missing	22% *(N = 1,319)*	13% *(N = 433)*	100% *(N = 9,082)*	37% *(N = 8,789)*	66% *(N = 5,709)*	**50% *(N = 25,332)***

School	EMCC	CGCC	NPC	PCC	YC	Combined
Total N	**5,996**	**3,386**	**9,082**	**23,636**	**8,606**	**50,706**
Veteran Status						
Veteran	8% *(N = 494)*	6% *(N =190)*	1% *(N = 128)*	7% *(N = 1,679)*	10% *(N = 822)*	**7%** ***(N = 3,313)***
Non-Veteran	90% *(N = 5,421)*	91% *(N = 3,091)*	99% *(N = 8,954)*	93% *(N = 21,957)*	90% *(N = 7,784)*	**93%** ***(N = 47,207)***
Missing	1% *(N = 81)*	3% *(N = 105)*	0% *(N = 0)*	0% *(N = 0)*	0% *(N = 0)*	**<1%** ***(N = 186)***

Note: Reported is the percentage of the total N with number of participants in parentheses.
†= Since race and ethnicity were combined in all study colleges except YC, the YC statistics are also combined here.

Prior educational attainment data are missing for too many students (35 percent of all ASC-GIEC study participants and for 50 percent of the other CTE students overall) to derive any reliable assessment of differences between ASC-GIEC participants and the other CTE students. The only meaningful comparison may be for CGCC, where similar proportions of values are missing for ASC-GIEC participants and the other CTE students. At CGCC, ASC-GIEC participants were less likely to have at least some college experience relative to the other CTE students at CGCC (47 percent vs. 58 percent, respectively).

A slightly higher percentage of ASC-GIEC participants were Veterans (9 percent of ASC-GIEC students vs. 7 percent of the other CTE students). EMCC, CGCC, and NPC all had higher proportions of Veterans among their ASC-GIEC participants than among their respective other CTE populations. However, at YC and PCC, the proportions of Veterans among study participants were slightly lower than among the other CTE students at those colleges. TAA status could not be compared because the information was not available for the other CTE students.

4.3.3 Comparisons with Arizona's Statewide Labor Force Participants

We use SIS data for ASC-GIEC participants and ACS data for statewide labor force participants to make two comparisons: (1) ASC-GIEC participants to all Arizona labor force participants, including all employed and unemployed workers in the state; and (2) ASC-GIEC participants with Arizona labor force participants in energy-related sectors, which include all employed and experienced unemployed workers[19] employed in manufacturing, construction,

KEY FINDINGS

- ASC-GIEC study participants were far more likely to be male, nonwhite, and less than 40 years old compared with those employed in similar industries across Arizona.
- ASC-GIEC program participants were slightly less likely to be Veterans compared to those employed in similar industries.

[19] Experienced unemployed workers are those previously employed in energy-related sectors.

mining, and utilities in the state of Arizona (Exhibit 29).[20] Important differences emerged between the two groups.

ASC-GIEC participants were much more likely to be male than Arizona labor force participants as a whole. Men were also overrepresented in the program relative to statewide labor force participants in energy-related sectors. ASC-GIEC also attracted a higher proportion of Hispanics, American Indians, and participants of other races, particularly relative to statewide labor force participants in energy-related sectors.

The age and education distributions of program participants at enrollment were also very different from those for statewide labor force participants in comparison to both Arizona's overall labor force and to the state's energy-related labor force. As expected, ASC-GIEC participants were much younger and less likely to have more than a high school education. Finally, the distribution of Veterans in the ASC-GIEC program mirrored that in the statewide labor force, but the proportion of Veterans was slightly lower among ASC-GIEC participants compared to their statewide labor force counterparts in energy-related sectors.

[20] These sectors were selected because they encompass the majority of occupations related to energy, including natural gas extraction, production, and distribution; alternative energy; energy wire manufacturing; solar energy equipment manufacturing; energy cutoff controls; and oil and gas machinery and equipment manufacturing. For a detailed breakdown of sectors, see: https://www.census.gov/eos/www/naics/index.html.

Exhibit 29. Characteristics of ASC-GIEC Participants and Arizona Labor Force Participants

	ASC-GIEC Participants	Arizona Labor Force Participants†	
		All	Energy-Related Sectors
Total N	**1,214**	**15,479**	**2,505**
Gender			
Female	10%	46%	21%
Male	89%	54%	79%
Missing	<1%	0%	0%
Race/Ethnicity†			
White	47%	65%	85%
African American	3%	3%	3%
Hispanic	26%	21%	5%
American Indian	6%	3%	2%
Other	14%	7%	6%
Missing	4%	0%	0%
Age			
18-19 Years	38%	<1%	<1%
20-24 Years	21%	5%	2%
25-29 Years	16%	9%	6%
30-39 Years	18%	21%	20%
40+ Years	8%	65%	71%
Missing	<1%	0%	0%
Education			
No High School	N/A	7%	10%
High School	26%	28%	34%
Some College	31%	19%	18%
Associate Degree	5%	10%	9%
College Degree	3%	37%	30%
Missing	35%	0%	0%
Veteran Status			
Veteran	9%	9%	11%
Non-Veteran	91%	91%	89%
Missing	<1%	0%	0%

Note: Reported is the sample proportion.

†= Source: Author tabulations of the 2013 American Community Survey. The left column includes all labor force participants in Arizona; the right column includes labor force participants in manufacturing, construction, mining, and utilities.

4.4 Educational Outcomes

Using SIS and NSC data, we constructed educational outcomes for ASC-GIEC participants. We first present descriptive analyses of these outcomes, and then use multivariate regression analyses to: (1) examine the relationship between student characteristics and outcomes, and (2) compare common educational outcomes between ASC-GIEC participants and the other CTE students.

As described previously, our outcomes of interest include:

1. Foundational course completion
2. Credential completion
3. Tier completion
4. Program completion
5. Transfer

These outcomes reflect the educational goals of the ASC-GIEC program and TAACCCT programs in general.

4.4.1 Descriptive Analyses

Foundational Course Completion (Career Readiness and Industry Fundamentals Courses). As described in the implementation study, the career readiness (tiers 1-3) and industry fundamentals (tiers 4-5) courses are key components of the ASC-GIEC competency model. To develop these competencies, the program's intent was that all program participants would take the foundational courses associated with each tier. However, as noted, only a relatively small portion of ASC-GIEC participants took these courses (Exhibit 30). Of the 1,214 ASC-GIEC participants, 33 percent took the career readiness course associated with the program's tier 1-3 training. A slightly higher proportion took the industry fundamentals course associated with completion of tier 4-5 training (35 percent).

KEY FINDINGS

- A substantial portion of ASC-GIEC participants did not take the courses associated with tiers 1-5. This varies across degree programs.
- A substantial portion of ASC-GIEC participants did not complete the credentials associated with tiers 1-5. This varies by when the student entered the college.
- Program completion rates were highest at NPC while rates of transfer to 4-year university were highest at CGCC.

Overall, almost half the participants (44 percent) took at least one of the two courses and nearly one-quarter (24 percent) took both. Study participants at EMCC were much more likely to take one or both courses compared to participants at the remaining colleges – likely because EMCC had implemented these components prior to the grant, and served as the model for other colleges to follow. At CGCC and YC, only 23 percent and 20 percent of participants, respectively,

took at least one of the two courses, while nearly half of NPC and PCC participants (44 percent and 47 percent, respectively) completed at least one course. NPC participants were much more likely to take the industry fundamentals course; PCC participants were evenly distributed.

To explore possible explanations for the low portion of students enrolling in these foundational courses, we examined course enrollment rates by period of entry. Since those who enrolled in the college earlier in the grant period started a degree program before the foundational courses were fully implemented, they may not have had the opportunity to take them (Exhibit 31).

There is some variation by semester of enrollment (Exhibit 31). As shown, 33 percent of all ASC-GIEC participants took the career readiness course. Enrollment rates for the career readiness course were lower among students beginning in Fall 2012 – Summer 2013 (24 percent) and Fall 2013 – Summer 2014 (25 percent), than for students beginning prior to Fall 2012 (34 percent) and in Fall 2014 or later (39 percent). We also find that enrollment rates in the industry fundamentals course for students beginning in Fall 2012 – Summer 2013 (28 percent) were lower than the rates of students beginning in other semesters.

There was, however, some variation across colleges. CGCC did see a steady increase in the portion of students taking these courses over the period of the grant. At EMCC, which had the highest course enrollment rates overall, fewer students who enrolled in Fall 2014 or later took the industry fundamentals course (41 percent). This may be because at the time data were made available, these students had not been in the program long enough to take that course. Similar patterns are observed for YC. However, this is not the case at other colleges. At CGCC and PCC, course enrollment rates were higher for students who began in Fall 2014 or later and in Fall 2013 or later, respectively. This coincides with the time when the program was in full operation at each college. Over the grant period, NPC saw a reduction in enrollment rates for the career readiness course over the grant period, while the rates of enrollment in the industry fundamentals course were at their highest levels among those enrolling between Fall 2012 and Summer 2014. Thus, while semester of college enrollment may contribute to low levels of foundational course enrollment at some colleges, the pattern is inconsistent.

Exhibit 30. Career Readiness and Industry Fundamentals Courses

School	EMCC	CGCC	NPC	PCC	YC	Combined
Total N	**261**	**272**	**208**	**236**	**237**	**1,214**
Career Readiness Course	82% *(N = 214)*	21% *(N = 56)*	7% *(N = 14)*	32% *(N = 75)*	17% *(N = 40)*	**33%** ***(N = 399)***
Industry Fundamentals Course	64% *(N = 167)*	19% *(N = 51)*	40% *(N = 84)*	39% *(N = 91)*	16% *(N = 37)*	**35%** ***(N = 430)***
Career Readiness or Industry Fundamentals Course	87% *(N = 226)*	23% *(N = 62)*	44% *(N = 91)*	47% *(N = 110)*	20% *(N = 47)*	**44%** ***(N = 536)***
Both Courses	59% *(N = 155)*	17% *(N = 45)*	3% *(N = 7)*	24% *(N = 56)*	13% *(N = 30)*	**24%** ***(N = 293)***

Note: Reported is the percentage of the total number of students with number of participants in parentheses.

Exhibit 31. Completion Rates of Career Readiness and Industry Fundamentals Courses, by Semester of Entry

School	EMCC	CGCC	NPC	PCC	YC	Combined
Total N	**261**	**272**	**208**	**236**	**237**	**1,214**
Career Readiness Course						
Before Fall 2012	83% *(N = 54)*	2% *(N =1)*	8% *(N = 1)*	25% *(N = 15)*	23% *(N = 10)*	**34% *(N = 81)***
Enrolled in Fall 2012 – Summer 2013	100% *(N = 22)*	0% *(N = 0)*	15% *(N = 2)*	18% *(N = 3)*	21% *(N = 10)*	**24% *(N = 37)***
Enrolled in Fall 2013 – Summer 2014	72% *(N = 33)*	11% *(N = 9)*	7% *(N = 4)*	42% *(N = 22)*	14% *(N = 9)*	**25% *(N = 77)***
Enrolled in Fall 2014 or Later	82% *(N = 105)*	59% *(N = 46)*	6% *(N = 7)*	33% *(N = 35)*	14% *(N = 11)*	**39% *(N = 204)***
Total Participants	**82% *(N = 214)***	**21% *(N = 56)***	**7% *(N = 14)***	**32% *(N =75)***	**17% *(N = 40)***	**33% *(N =399)***
Industry Fundamentals Course						
Before Fall 2012	89% *(N = 58)*	2% *(N = 1)*	25% *(N = 3)*	34% *(N = 20)*	19% *(N = 8)*	**38% *(N = 90)***
Enrolled in Fall 2012 – Summer 2013	100% *(N = 22)*	2% *(N = 1)*	69% *(N = 9)*	18% *(N = 3)*	17% *(N = 8)*	**28% *(N = 43)***
Enrolled in Fall 2013 – Summer 2014	74% *(N = 34)*	11% *(N = 9)*	67% *(N = 38)*	43% *(N = 23)*	14% *(N = 9)*	**37% *(N = 113)***
Enrolled in Fall 2014 or later	41% *(N = 53)*	51% *(N = 40)*	27% *(N = 34)*	42% *(N = 45)*	15% *(N = 12)*	**35% *(N = 184)***
Total Participants	**64% *(N = 167)***	**19% *(N = 51)***	**40% *(N = 84)***	**39% *(N = 91)***	**16% *(N = 37)***	**35% *(N = 430)***

Note: Reported is the course enrollment rate by semester of entry.

While the ASC-GIEC competency model assumes all program participants will take the foundational courses, only some degrees and certificates require the student to take these courses to earn a credential. Therefore, we examined whether low enrollment rates are correlated with the student's degree as reported in SIS (Exhibit 32).

At EMCC, among participants who declared an ASC-GIEC option, the majority was concentrated in Power Plant Technology and enrolled in both courses (89 percent for career readiness and 72 percent for industry fundamentals). However, at the other colleges, course enrollment varied substantially depending on the ASC-GIEC degree declared by the participant. At CGCC and YC, those enrolled in the EUT programs were much more likely to take these courses than students enrolled in other degrees. None of CGCC's 47 Engineering Technology students took either course, due at least in part to these not being required for such students to obtain a degree. Additionally, because this program is designed to facilitate transfer to a four-year institution, many students had long-term interests that do not directly align with the career training focus of the program and these courses specifically. At NPC, only a small portion of participants took either course, although IMO students were substantially more likely than Mechatronics or Welding students to do so. At PCC, about half of Building and Construction students took these courses. Since the ASC-GIEC competency model embeds key components in these courses, these results indicate that a large proportion of ASC-GIEC students did not receive important program components considered integral to the ASC-GIEC program.

Exhibit 32. Percent Completing Foundational Courses, by Degree Program

School/Degree	Number of Students Declaring Degree	% of Students Completing Career Readiness Course	% of Students Completing Industry Fundamentals Course
EMCC	**261**	**82%** ***(N =214)***	**64%** ***(N = 167)***
Power Plant Technology	190	89% *(N = 170)*	72% *(N = 136)*
IT Security	1	100% *(N = 1)*	100% *(N = 1)*
Undeclared	2	50% *(N = 1)*	50% *(N = 1)*
Non-GIE Program	68	62% *(N = 42)*	43% *(N = 29)*
CGCC	**272**	**21%** ***(N =56)***	**19%** ***(N = 51)***
Electrical Utility Technology	118	44% *(N = 52)*	40% *(N = 47)*
Engineering Technology	47	0% *(N = 0)*	0% *(N = 0)*
Undeclared	2	0% *(N = 0)*	0% *(N = 0)*
Non-GIE Program	105	4% *(N = 4)*	4% *(N = 4)*
NPC	**208**	**7%** ***(N =14)***	**40%** ***(N = 84)***
Industrial Maintenance Operation	53	15% *(N= 8)*	74% *(N = 39)*
Mechatronics	8	0% *(N = 0)*	13% *(N = 1)*
Welding	91	2% *(N = 2)*	1% *(N = 1)*
Non-GIE Program	56	7% *(N = 4)*	77% *(N = 43)*
PCC	**236**	**32%** ***(N =75)***	**39%** ***(N = 91)***
Building and Construction	126	48% *(N = 60)*	58% *(N = 73)*
Non-GIE Program	110	14% *(N = 15)*	16% *(N = 18)*

School/Degree	Number of Students Declaring Degree	% of Students Completing Career Readiness Course	% of Students Completing Industry Fundamentals Course
YC	**237**	**17%** ***(N = 40)***	**16%** ***(N = 37)***
Electrical Instrumentation	67	18% *(N = 12)*	13% *(N = 9)*
EUT	35	71% *(N = 25)*	80% *(N = 28)*
Welding	111	1% *(N = 1)*	0% *(N = 0)*
Pre-Engineering	13	0% *(N = 0)*	0% *(N = 0)*
Non-GIE Program	11	18% *(N = 2)*	0% *(N = 0)*

Note: Reported is the sample proportion with number of participants in parentheses.

Credential Completion. In addition to the foundational courses, a key component of the ASC-GIEC competency model is implementation of industry-recognized credentials that demonstrate career readiness and energy industry competencies. These include the NCRC and credentials, which each college offers concurrently with the career readiness and industry fundamentals courses. Information on the attainment of these credentials was not available for EMCC. Of the 953 participants in the four remaining colleges, only 28 percent obtained the NCRC and only 19 percent obtained the EIF credential (Exhibit 33). Overall, a little over a third of all participants (34 percent) obtained one of the two credentials; fewer than one in every six obtained both (13 percent).

Exhibit 33. Credential Attainment, ASC-GIEC Participants

School	CGCC	NPC	PCC	YC	Combined
Total N	**272**	**208**	**236**	**237**	**953**
NCRC	26% *(N = 70)*	46% *(N = 95)*	32% *(N = 75)*	10% *(N = 24)*	**28%** ***(N = 264)***
EIF	19% *(N = 51)*	4% *(N = 8)*	39% *(N = 91)*	13% *(N = 31)*	**19%** ***(N = 181)***
NCRC or EIF	30% *(N = 82)*	46% *(N = 95)*	47% *(N = 110)*	16% *(N = 37)*	**34%** ***(N = 324)***
NCRC and EIF	14% *(N = 39)*	4% *(N = 8)*	24% *(N = 56)*	8% *(N = 18)*	**13%** ***(N = 121)***

Note: Reported is the sample proportion of total N with number of participants in parentheses.

YC had the lowest credential completion rates, with only 16 percent of participants receiving at least one of the two credentials. NPC and PCC had the highest completion rates (46 and 47 percent respectively). At NPC this was driven by the fact that 46 percent of participants obtained the NCRC. This is much higher than the proportion taking the career readiness course at NPC (7 percent, see Exhibit 30) and exceeds the proportion that obtained the same certificate in the

other colleges. At PCC, the proportions of participants obtaining one or both certificates (Exhibit 33) are the same as the proportions taking the foundational courses – implying that PCC emphasized completing course and credential tier-training requirements simultaneously. The majority of CGCC participants who took the two courses also obtained the corresponding credentials.

To examine why credential completion was so low, we again looked for any association with the student's semester of entry (Exhibit 34). Attainment rates do tend to increase for students who entered later into the grant period – with a much higher proportion of students enrolled in Fall 2014 or later attaining the NCRC (40 percent) than students enrolled in previous semesters. The patterns are similar for EIF attainment rates, and for NCRC or EIF attainment rates. However, even among the later cohorts, completion rates remained low.

Exhibit 34. Credential Attainment, ASC-GIEC Participants, by Semester of Entry

School	CGCC	NPC	PCC	YC	Combined
Total N	**272**	**208**	**236**	**237**	**953**
NCRC	**26%** ***(N = 70)***	**46%** ***(N = 95)***	**32%** ***(N = 75)***	**10%** ***(N = 24)***	**28%** ***(N = 264)***
Before Fall 2012	5% *(N = 3)*	8% *(N = 1)*	25% *(N = 15)*	16% *(N = 7)*	**15%** ***(N = 26)***
Enrolled in Fall 2012 – Summer 2013	11% *(N = 6)*	15% *(N = 2)*	18% *(N = 3)*	4% *(N = 2)*	**10%** ***(N = 13)***
Enrolled in Fall 2013 – Summer 2014	23% *(N = 19)*	37% *(N = 21)*	42% (N = 22)	9% *(N = 6)*	**26%** ***(N = 68)***
Enrolled in Fall 2014 or Later	54% *(N = 42)*	56% *(N = 71)*	33% *(N = 35)*	11% *(N = 9)*	**40%** ***(N = 157)***
EIF	**19%** ***(N = 51)***	**4%** ***(N = 8)***	**39%** ***(N = 91)***	**13%** ***(N = 31)***	**19%** ***(N = 181)***
Before Fall 2012	2% *(N = 1)*	0% *(N = 0)*	34% *(N = 20)*	16% *(N = 7)*	**16%** ***(N = 28)***
Enrolled in Fall 2012 – Summer 2013	2% *(N = 1)*	8% *(N = 1)*	18% *(N = 3)*	13% *(N = 6)*	**8%** ***(N = 11)***
Enrolled in Fall 2013 – Summer 2014	11% *(N = 9)*	0% *(N = 0)*	43% *(N = 23)*	11% *(N= 7)*	**15%** ***(N = 39)***
Enrolled in Fall 2014 or Later	51% *(N = 40)*	6% *(N= 7)*	42% *(N = 45)*	14% *(N = 11)*	**26%** ***(N = 103)***
NCRC or EIF	**30%** ***(N = 82)***	**46%** ***(N = 95)***	**47%** ***(N = 110)***	**16%** ***(N = 37)***	**34%** ***(N = 324)***
Before Fall 2012	5% *(N = 3)*	8% *(N = 1)*	39% *(N = 23)*	23% *(N = 10)*	**21%** ***(N = 37)***
Enrolled in Fall 2012 – Summer 2013	11% *(N = 6)*	15% *(N = 2)*	24% *(N = 4)*	13% *(N = 6)*	**14%** ***(N = 18)***
Enrolled in Fall 2013 – Summer 2014	28% *(N = 23)*	37% *(N = 21)*	45% *(N = 24)*	14% *(N = 9)*	**30%** ***(N = 77)***
Enrolled in Fall 2014 or Later	64% *(N = 50)*	56% *(N = 71)*	55% *(N = 59)*	15% *(N = 12)*	**49%** ***(N = 192)***

Note: Reported is the credential attainment rate by semester of entry.

Generally, credential attainment rates tended to be highest among participants in the degree programs that also had high foundational course enrollment rates (Exhibit 35). This is likely because each credential is associated with one of the foundational courses. The exception to this trend is NPC, which saw a relatively high NCRC completion rate across degrees while only 4 percent of participants at NPC completed the EIF.

Exhibit 35. Credential Attainment, ASC-GIEC Participants, by Degree Program

	Total N	NCRC	EIF
CGCC	**272**	**26% (N = 70)**	**19% *(N = 51)***
Electrical Utility Technology	118	56% *(N = 66)*	40% *(N = 47)*
Engineering Technology	47	0% *(N = 0)*	0% *(N = 0)*
Non-GIE Program	105	4% *(N = 4)*	4% *(N = 4)*
Undeclared	2	0% *(N = 0)*	0% *(N = 0)*
NPC	**208**	**46% *(N = 95)***	**4% *(N = 8)***
Industrial Maintenance Operation	53	38% *(N = 20)*	2% *(N = 1)*
Mechatronics	8	75% *(N = 6)*	0% *(N = 0)*
Welding	91	52% *(N = 47)*	1% *(N = 1)*
Non-GIE Program	56	39% *(N = 22)*	11% *(N = 6)*
PCC	**236**	**32% *(N = 75)***	**39% *(N = 91)***
Building and Construction	126	48% *(N = 60)*	63% *(N = 73)*
Non-GIE Program	110	14% *(N= 15)*	15% *(N = 18)*
YC	**237**	**10% *(N = 24)***	**13% *(N = 31)***
Electrical Instrumentation	67	15% *(N = 10)*	9% *(N = 6)*
EUT	35	40% *(N= 14)*	71% *(N = 25)*
Welding	111	0% *(N = 0)*	0% *(N = 0)*
Pre-Engineering	13	0% *(N = 0)*	0% *(N = 0)*
Non-GIE Program	11	0% *(N = 0)*	0% *(N = 0)*

Note: Left column reports number of participants by degree program; two right columns report credential attainment rates.

Tier Completion. In the ASC-GIEC competency model, tiers 1-3 and 4-5 involve completion of the associated foundational courses and credentials. We analyze the extent to which ASC-GIEC students completed all tier 1-3 and tier 4-5 components – that is, took the required courses *and*

obtained the relevant credentials, again excluding EMCC because of lack of data on credential attainment (Exhibit 36). Of all participants, 16 percent of participants completed tier 1-3 training – that is, took the career readiness course and obtained the NCRC. Similarly, 19 percent completed tier 4-5 training – that is, took the industry fundamentals course and obtained the EIF certificate. About 11 percent of participants completed both tiers.

Individual college results show that participants at PCC were the most likely to complete one or both tier trainings. NPC had the lowest completion rates (4 percent for both tiers). No NPC students completed all requirements for both tiers, which reflects two factors: (1) most NPC students who obtained the NCRC did not complete the career readiness course, and (2) very few NPC students obtained the EIF certificate.

Exhibit 36. Tier Completion, ASC-GIEC Participants

School	CGCC	NPC	PCC	YC	Combined
Total N	**272**	**208**	**236**	**237**	**953**
Completed Tier 1-3	17% *(N = 46)*	4% *(N = 8)*	32% *(N = 75)*	10% *(N = 23)*	**16% *(N = 152)***
Completed Tier 4-5	19% *(N = 51)*	4% *(N = 8)*	39% *(N = 91)*	12% *(N = 29)*	**19% *(N = 179)***
Completed Tier 1-3 and Tier 4-5	14% *(N = 37)*	0% *(N = 0)*	24% *(N = 56)*	7% *(N = 16)*	**11% *(N = 109)***

Note: Reported is the sample proportion of total N with number of participants in parentheses

Program Completion and Transfer. In this analysis we looked at whether ASC-GIEC participants: (1) completed their program of study (received a program degree or certificate) and (2) transferred to a four-year institution. About 25 percent of all participants received the degree or certificate required to complete their program, and 8 percent transferred to a four-year institution (Exhibit 37). These outcomes varied considerably across colleges. CGCC had the second highest program completion rate (33 percent) and the highest transfer rate (26 percent). The latter may be related to the fact that CGCC's ASC-GIEC engineering program is specifically designed to lead to transfer. EMCC had much lower program completion rates (5 percent) than the other colleges and only a 3 percent transfer rate. Program completion was highest at NPC (43 percent), while about one in every four YC participants and one in every five PCC participants completed their program. Transfer rates were below 5 percent for all the colleges except CGCC.

Exhibit 37. Program Completion Outcomes, ASC-GIEC Participants

School	EMCC	CGCC	NPC	PCC	YC	Combined
Total N	**261**	**272**	**208**	**236**	**237**	**1,214**
Completed Program	5% *(N = 13)*	33% *(N = 90)*	43% *(N = 90)*	20% *(N = 48)*	24% *(N = 58)*	**25%** ***(N= 299)***
Transfer	3% *(N = 9)*	26% *(N= 72)*	4% *(N = 9)*	2% *(N = 5)*	<1% *(N = 2)*	**8%** ***(N = 97)***

Note: Reported is the sample proportion of total N with number of participants in parentheses.

Not surprisingly, program completion and transfer rates varied by semester of entry. As shown in Exhibit 38, program completion rates for participants enrolled before Fall 2012 were 35 percent; this declined to 17 percent for students enrolled in Fall 2014 or later, likely because students did not have enough time to complete the program within the time for which data are available. Similarly, the transfer rate for students enrolled before Fall 2012 was 3 percent, compared with 2 percent for those enrolled in Fall 2014 or later. These patterns were consistent across colleges with a few exceptions. At NPC, there was limited variation in program completion rates based on semester of entry, while at EMCC, transfer rates were much higher for students enrolled in Fall 2014 or later than those enrolled in earlier semesters.

Exhibit 38. Program Completion Outcomes, ASC-GIEC Participants, by Semester of Entry

School	EMCC	CGCC	NPC	PCC	YC	Combined
Total N	**261**	**272**	**208**	**236**	**237**	**1,214**
Completed Program	**5%** ***(N = 13)***	**33%** ***(N = 90)***	**43%** ***(N = 90)***	**20%** ***(N = 48)***	**24%** ***(N = 58)***	**25%** ***(N= 299)***
Before Fall 2012	3% *(N = 7)*	48% *(N = 28)*	42% *(N = 5)*	39% *(N = 23)*	47% *(N = 20)*	35% *(N = 83)*
Enrolled in Fall 2012 – Summer 2013	14% *(N = 3)*	18% *(N = 16)*	46% *(N = 6)*	18% *(N = 3)*	28% *(N = 13)*	27% *(N = 41)*
Enrolled in Fall 2013 – Summer 2014	7% *(N = 3)*	35% *(N = 28)*	42% *(N = 24)*	34% *(N = 18)*	20% *(N = 13)*	28% *(N = 86)*
Enrolled in Fall 2014 or later	0% *(N = 0)*	23% *(N = 18)*	44% *(N = 55)*	4% *(N = 4)*	15% *(N = 12)*	17% *(N = 89)*
Transfer	**3%** ***(N = 9)***	**26%** ***(N= 72)***	**4%** ***(N = 9)***	**2%** ***(N = 5)***	**<1%** ***(N = 2)***	**8%** ***(N = 97)***
Before Fall 2012	11% *(N = 3)*	54% *(N = 31)*	8% *(N = 1)*	3% *(N =2)*	2% *(N =1)*	3% *(N = 38)*
Enrolled in Fall 2012 – Summer 2013	0% *(N = 0)*	35% *(N = 19)*	0% *(N = 0)*	6% *(N = 1)*	0% *(N = 0)*	2% *(N = 20)*
Enrolled in Fall 2013 – Summer 2014	0% *(N = 0)*	16% *(N = 13)*	5% *(N =3)*	4% *(N = 2)*	2% *(N = 1)*	2% *(N = 19)*
Enrolled in Fall 2014 or later	23% *(N = 6)*	12% *(N = 9)*	4% *(N = 5)*	0% *(N = 0)*	0% *(N = 0)*	2% *(N = 20)*

Note: Reported is the outcome rate by semester of entry.

4.4.2 Multivariate Regression Analyses

In this section we look at how much of the variation across colleges in educational outcomes of ASC-GIEC participants relates to participant characteristics. To do this, we estimated regression models for selected outcomes, which control for individual characteristics (gender, race/ethnicity, age, Veteran status, and TAA status),[21] college of enrollment, and semester of entry. We present the results of these analyses below and use them to disentangle the relationship between participant outcomes, individual characteristics, and college of enrollment.

KEY FINDINGS

- Male students, those who are not TAA-eligible, and students at EMCC were significantly more likely to take foundational courses.
- Female students and those who are TAA-eligible were significantly less likely to complete the NCRC and EIF credentials.
- TAA-eligible individuals were significantly less likely to complete the ASC-GIEC program than those who were not TAA-eligible.
- CGCC students were significantly more likely to transfer to a four-year university than individuals at other colleges.
- ASC-GIEC participants were significantly more likely than the other CTE students to complete their degree, but were less likely to transfer to a four-year institution.

Foundational Course Enrollment. Our regression analysis, which controlled for differences in individual characteristics, assessed three outcomes related to course enrollment: (1) whether the study participant took the career readiness course; (2) whether the participant took the industry fundamentals course; and (3) whether the participant took both courses (Exhibit 39). Note that for each characteristic (e.g., age), the analysis measures difference from the reference category – which is denoted by dashes (e.g., 18-19 years in the case of age).

For career readiness (column 1), males were significantly more likely to take the course than females (by 5.6 percentage points). There were virtually no statistically significant differences in course enrollment by race/ethnicity, age categories, and Veteran status. However, TAA-eligible participants were 17.4 percentage points less likely than non-TAA eligible participants to take the career readiness course. Important differences remain across colleges. EMCC participants were 53.6 percentage points more likely than CGCC participants to take the career readiness course. In contrast, NPC and YC participants were less likely than CGCC participants to take the course. The likelihood of PCC participants taking the course was not statistically different from the likelihood of CGCC participants doing so.

For the industry fundamentals course (column 2), male participants were again significantly more likely than female participants to take the course (by 8.6 percentage points). For race/ethnicity, American Indians were 24.6 percentage points less likely than whites to take the course. There

[21] Prior education is not included in the analyses since this information is missing for a large proportion of participants.

are also statistically significant differences by age. Participants in the 25-29 years and 30-39 years categories were significantly more likely than those in the 18-19 years category to take the industry fundamentals course and TAA-eligible participants were less likely to take it compared to non-TAA participants. Participants at EMCC, NPC, and PCC were more likely than those at CGCC to take the course. YC participants were much less likely to do so.

Taking both foundational courses also differed statistically among different groups (column 3). Male participants were 7.5 percentage points more likely than female participants to take both foundational courses. American Indian students were 6.8 percentage points less likely than white students to take both courses. For age, students in the 20-24 year and 25-29 year categories were more likely than the youngest group to take both courses. Veteran status did not statistically affect course enrollment, but TAA-eligible students were much less likely than other students to take both courses. Important variation is evident across colleges, with EMCC participants much more likely to take both courses compared to CGCC participants, PCC somewhat more likely to, and NPC less likely to.

Exhibit 39. Career Readiness and Industry Fundamentals Course Enrollment, Regression Results

	[1] Career Readiness Course	[2] Industry Fundamentals Course	[3] Both Courses
Outcome Mean	**.329**	**.355**	**.241**
Gender			
Female	--	--	--
Male	.056 (.032)*	.086 (.036)**	.075 (.031)**
Missing	-.011 (.112)	-.034 (.112)	.027 (.100)
Race/Ethnicity			
White	--	--	--
African American	-.045 (.064)	.052 (.083)	-.054 (.073)
Hispanic	.004 (.029)	-.001 (.033)	-.011 (.031)
American Indian	-.031 (.043)	-.246 (.054)***	-.068 (.031)**
Other	.000 (.026)	.005 (.032)	-.015 (.035)
Missing	-.069 (.048)	-.171 (.048)***	-.144 (.043)***
Age			
18-19 Years	--	--	--
20-24 Years	.033 (.029)	.045 (.034)	.074 (.031)**
25-29 Years	.005 (.029)	.122 (.036)***	.135 (.034)***
30-39 Years	.007 (.029)	.084 (.035)**	.048 (.032)
40+ Years	.028 (.041)	.041 (.048)	.008 (.041)
Missing	.414 (.229)*	.375 (.217)*	.435 (.229)*
Veteran Status			
Non-Veteran	--	--	--
Veteran	.043 (.037)	-.058 (.043)	-.026 (.041)
Missing	-.312 (.217)	-.155 (.194)	-.113 (.211)
TAA-Eligibility			
Non-Eligible	--	--	--
TAA-Eligible	-.174 (.036)***	-.225 (.037)***	-.170 (.034)***
Missing	-.065 (.021)***	-.026 (.032)	-.112 (.024)***
College			
EMCC	.536 (.040)***	.379 (.045)***	.377 (.044)***
CGCC	--	--	--
NPC	-.173 (.042)***	.214 (.053)***	-.097 (.041)**
PCC	.078 (.049)	.132 (.056)**	.105 (.048)**
YC	-.237 (.035)***	-.258 (.039)***	-.046 (.044)
Observations	**1,214**	**1,214**	**1,214**
R-Squared	**.454**	**.269**	**.262**

Note: Reported are estimated parameters with standard errors in parenthesis. Standard errors are robust standard errors. Included in the regressions, but not reported, are fixed effects for semester of entry. ***, **, * = statistically significant at the 1, 5, 10 percent level.

Credential Attainment. Our regression analysis examined three credential-related outcomes, once again controlling for individual characteristics at baseline: whether the ASC-GIEC study participant obtained the NCRC (column 1); whether the participant obtained the EIF certificate (column 2); and whether the participant obtained the NCRC or the EIF certificate (column 3) (Exhibit 40). EMCC participants were excluded from this analysis since there are no credential data available. Male participants were statistically more likely than female participants to obtain the NCRC. No significant differences were detected by race/ethnicity, age, or Veteran status, except for the missing categories. TAA-eligible participants were 22.2 percentage points less likely than others to obtain the NCRC. For colleges, NPC participants were significantly more likely than those at CGCC to obtain the NCRC; YC participants were less likely to do so.

Similar patterns are observed for EIF certificate attainment (column 2). Female and TAA-eligible participants were less likely to obtain the EIF certificate, with no significant differences for age or Veteran status. American Indians were less likely than whites to obtain the EIF certificate. NPC and YC participants were much less likely than those at CGCC to obtain the EIF certificate; PCC participants were much more likely than participants at other colleges to obtain the certificate.

For attainment of the NCRC or EIF, females, participants that are 40 or older, and TAA-eligible individuals were much less likely to obtain either certificate. There is also important variation across colleges. YC had much a lower certificate attainment rate than CGCC, while PCC had a higher rate.

Exhibit 40. Regression Results, Credential Attainment

	[1] NCRC	[2] EIF	[3] NCRC/EIF
Outcome Mean	**.329**	**.355**	**.266**
Gender			
Female	--	--	--
Male	.091 (.041)**	.093 (.032)***	.155 (.042)***
Missing	.015 (.112)	-.059 (.102)	-.020 (.103)
Race/Ethnicity			
White	--	--	--
African American	-.102 (.090)	.084 (.083)	.065 (.083)
Hispanic	-.055 (.038)	-.022 (.034)	-.018 (.039)
American Indian	-.070 (.062)	-.074 (.030)**	-.071 (.061)
Other	-.029 (.040)	-.000 (.037)	-.001 (.044)
Missing	-.064 (.064)	-.137 (.048)***	-.079 (.068)
Age			
18-19 Years	--	--	--
20-24 Years	-.022 (.039)	.034 (.034)	-.042 (.040)
25-29 Years	-.002 (.045)	.021 (.036)	-.053 (.046)
30-39 Years	-.046 (.042)	.003 (.035)	-.066 (.043)
40+ Years	-.051 (.053)	-.035 (.042)	-.105 (.055)*
Missing	.286 (.154)*	.240 (.149)	.131 (.134)
Veteran Status			
Non-Veteran	--	--	--
Veteran	-.022 (.058)	-.063 (.043)	-.008 (.060)
Missing	-.360 (.155)**	-.163 (.148)	-.347 (.136)**
TAA Eligibility			
Non-Eligible	--	--	--
TAA-Eligible	-.222 (.043)***	-.198 (.033)***	-.277 (.044)***
Missing	-.075 (.038)*	-.076 (.025)***	-.086 (.040)**
College			
CGCC	--	--	--
NPC	.144 (.055)***	-.204 (.039)***	.079 (.054)
PCC	.022 (.061)	.168 (.051)***	.103 (.062)*
YC	-.185 (.048)***	-.095 (.045)**	-.204 (.050)***
Observations	**953**	**953**	**953**
R-squared	**.161**	**.191**	**.189**

Note: Reported are estimated parameters with standard errors in parenthesis. Standard errors are robust standard errors. Included in the regressions, but not reported, are fixed effects for semester of entry. ***, **, * = statistically significant at the 1, 5, 10 percent level.

Program Completion and Transfers. The outcomes assessed in this analysis are program completion and transfer to a four-year degree program (Exhibit 41). For program completion, there were no significant differences by gender. The only significant difference from white participants was the "other race" group, who were significantly less likely to complete the program. For age, the only significant difference from the 18-19 year old reference category was for 20-24 year old participants, who were less likely to complete their program of study. There was no variation in program completion by Veteran status; TAA-eligible participants were much less likely to complete their program than other participants. For the colleges, EMCC participants were much less likely to complete their program than their counterparts at CGCC; NPC participants were more likely to do so.

With regard to transfer outcomes, male participants were less likely to transfer to a four-year institution than female participants. Participants age 25-29 had lower transfer rates than the 18-19 group. Participants in each of the other colleges were less likely to transfer than CGCC participants.

Exhibit 41. Regression Results, Program Completion and Transfers

	[1] Completed Program	[2] Transfer 4-year
Outcome Mean	**.246**	**.079**
Gender		
Female	--	--
Male	.019 (.038)	-.082 (.034)***
Missing	-.081 (.065)	-.106 (.040)***
Race/Ethnicity		
White	--	--
African American	-.063 (.053)	.023 (.043)
Hispanic	-.025 (.031)	-.005 (.018)
American Indian	.018 (.065)	.032 (.036)
Other	-.113 (.043)***	.003 (.021)
Missing	-.073 (.056)	-.058 (.045)
Age		
18-19 Years	--	--
20-24 Years	-.071 (.033)**	-.016 (.022)
25-29 Years	-.052 (.037)	-.045 (.020)*
30-39 Years	-.043 (.035)	-.028 (.019)
40+ Years	-.052 (.048)	.-017 (.027)
Missing	.020 (.305)	.088 (.175)
Veteran Status		
Non-Veteran	--	--
Veteran	.037 (.043)	.032 (.030)
Missing	-.009 (.214)	-.005 (.073)
TAA Eligibility		
Non-Eligible	--	--
TAA-Eligible	-.185 (.049)***	.070 (.044)
Missing	-.099 (.042)**	.0019 (.016)
College		
EMCC	-.322 (.037)***	-.213 (.031)***
CGCC	--	--
NPC	.134 (.056)**	-.181 (.033)***
PCC	-.056 (.061)	-.221 (.033)***
YC	-.079 (.054)	-.223 (.031)***
Observations	**1,214**	**1,214**
R-squared	**.135**	**.171**

Note: Reported are estimated parameters with standard errors in parenthesis. Standard errors are robust standard errors. Included in the regressions, but not reported, are fixed effects for semester of entry. ***, **, * = statistically significant at the 1, 5, 10 percent level.

Program Completion and Transfers, ASC-GIEC Participants vs. the Other CTE Students. Finally, we compared program completion and four-year transfer rates among ASC-GIEC study participants to the other CTE students. Note that transfer data were not available for the other CTE students at CGCC. It is important to reiterate that these analyses do not provide estimates of the impact of the ASC-GIEC program on program completion and transfer rates, because any differences cannot be solely attributable to program effectiveness because of the potential influence of unobserved factors differentiating the two groups. Nevertheless, such comparisons are useful for obtaining evidence on whether participants were more likely to experience higher completion or transfer rates than those in other CTE programs.

ASC-GIEC participants were more likely to complete their program of study than were the other CTE students (Exhibit 42), with considerable variation across colleges. At EMCC, very few students completed their program regardless of whether they are ASC-GIEC participants or not (5 percent). At CGCC and NPC, program completion rates were substantially higher for participants, while very similar proportions of both groups' students completed their programs at YC and PCC.

Exhibit 42. Program Completion Outcomes, ASC-GIEC Participants vs. the Other CTE Students

School	EMCC	CGCC	NPC	PCC	YC	Combined
Total ASC GIEC	**261**	**272**	**208**	**236**	**237**	**1,214**
Total Other CTE Students	**5,596**	**3,386**	**9,082**	**23,636**	**8,606**	**50,706**
Completed Program						
ASC-GIEC Participants	5% *(N = 13)*	33% *(N = 90)*	43% *(N = 90)*	20% *(N = 48)*	24% *(N = 58)*	**25% *(N= 299)***
Other CTE Students	5% *(N = 260)*	<1% *(N = 14)*	4% *(N = 403)*	23% *(N = 5,334)*	25% *(N = 2,143)*	**16% *(N = 8,154)***
Transfer						
ASC-GIEC Participants	3% *(N = 9)*	26% *(N= 72)*	4% *(N = 9)*	2% *(N = 5)*	<1% *(N = 2)*	**8% *(N = 97)***
Other CTE Students	5% *(N = 276)*	N/A	7% *(N = 661)*	9% *(N = 2,107)*	10% *(N = 832)*	**8% *(N = 3,876)***

Note: Note: Reported is the number of participants, with sample proportion in parentheses. Transfer numbers were not available for the other CTE students at CGCC.

With respect to transfer rates, about 8 percent of both ASC-GIEC participants and the other CTE students transferred to a four-year institution. We observe particularly high ASC-GIEC participant transfer rates at CGCC (26 percent). But for colleges where transfer rates are available for both ASC-GIEC participants and the other CTE students, four-year transfer rates were small for both groups, but generally lower among program participants.

Taken at face value, these comparisons suggest that ASC-GIEC participants were more likely than students in other CTE programs to complete their program and about as likely to transfer to a degree program. However, as noted, these differences may be attributed to many factors other

than the program. For example, our earlier analyses suggest that program completion and transfer rates are correlated with semester of enrollment. In addition, some demographic groups may be more likely than others to complete their program or transfer to a degree program. To the extent that the participant and other CTE populations differ along these dimensions – both within and across colleges – the observed differences may not provide a reliable assessment.

For this reason, we also estimated regression models for each outcome that control for demographic characteristics at baseline (Exhibit 43). ASC-GIEC participants were 16.1 percentage points more likely to complete their degree program relative to the other CTE students (column 1). As shown in column 2 (which excludes CGCC students, for whom transfer rates were not available) ASC-GIEC participants were 3.8 percentage points less likely than the other CTE students to transfer to a four-year institution. According to these results, ASC-GIEC programs were significantly more likely to complete their degree, but much less likely to transfer than other CTE students with the same demographic and other measured characteristics.

Exhibit 43. Regression Results, Program Completion, ASC-GIEC Participants vs. the Other CTE Students

	[1] Completed Program	[2] Transfer
Other CTE Student Outcome Mean	**.161**	**.096**
ASC-GIEC Participant	**.161 (.012)*** **	**-.038 (.007)*** **
Gender		
Female	--	--
Male	-.022 (.003)***	-.024 (.003)***
Missing	-.081 (.009)***	.016 (.010)*
Race/Ethnicity		
White	--	--
African American	-.034 (.006)***	.004 (.006)
Hispanic	-.018 (.004)***	-.029 (.003)***
American Indian	-.017 (.006)**	-.011 (.005)**
Other	-.005 (.004)	-.003 (.004)
Missing	.031 (.009)***	-.025 (.006)***
Age		
18-19 years	--	--
20-24 years	.021 (.004)***	.003 (.004)
25-29 years	.058 (.004)***	-.022*** (.004)***
30-39 years	.064 (.004)***	-.035*** (.004)***
40+ years	.056 (.004)***	-.065*** (.004)***
Missing	.080 (.033)**	-.110*** (.016)***
Veteran Status		
Non-Veteran	--	--
Veteran	.017 (.006)**	.046*** (.006)***
Missing	.029 (.022)	-.001 (.017)
College		
EMCC	-.010 (.004)**	--
CGCC	--	--
NPC	.027 (.004)***	-.028 (.004)***
PCC	.162 (.003)***	-.048 (.003)***
YC	.158 (.005)***	-.040 (.003)***
Observations	**51,920**	**48,262**
R-squared	**.150**	**.027**

Note: Reported are estimated parameters with standard errors in parenthesis. Standard errors are robust standard errors. Included in the regressions, but not reported, are fixed effects for semester of entry. ***, **, * = statistically significant at the 1, 5, 10 percent level.

4.5 Summary of Outcomes

Overall, the ASC-GIEC program attracted a racially and ethnically diverse student population that approximated the composition of the communities the consortium colleges served, except in gender. Males were substantially overrepresented in comparison to both the other CTE students at the consortium colleges and those in the energy-related labor force in Arizona as a whole. This supports our findings from the implementation study that consortium colleges had a difficult time recruiting women. There was, however, an increase in female enrollment later in the grant period, which may reflect more successful efforts by the colleges to target outreach toward this population.

Providing training to TAA-eligible and displaced workers, a group that tends to be older than the traditional college population, is a primary goal of the TAACCCT grant program. While a large portion of ASC-GIEC study participants were older than traditional students, participants were substantially younger than the average TAA-eligible worker. Additionally, ASC-GIEC participants tended to be younger than the other CTE students. Self-reported TAA-eligibility data suggest that, with the exception of CGCC, there were relatively few TAA-eligible participants in the program.

The courses and credentials associated with tiers 1-5 represent a key component of the ASC-GIEC competency model. However, our analyses show that less than half the program participants took the career readiness or the industry fundamentals course, with only about a quarter taking both. At the same time, a little over a third of participants obtained the NCRC or EIF certificates, with only 13 percent obtaining both. This suggests that a large portion of students were not receiving important components of the program. Even so, these outcomes varied considerably by college. Course participation was particularly high at EMCC, but low at YC and CGCC. At the same time, credential attainment was relatively high at NPC and PCC, with lower attainment rates at CGCC and YC. Further analyses reveal variation in foundational course enrollment and credential attainment related to the student's degree program.

About a quarter of ASC-GIEC study participants obtained the degree or certificate required to complete their program of study, and 8 percent transferred to a four-year institution. As expected, the enrollment trends showed differences across time correlated with the stage of implementation of the program.

Regression analyses that control for individual characteristics, college, and semester of entry provide additional insights into variation in outcomes among ASC-GIEC study participants. Male participants were significantly more likely than female participants to take the ASC-GIEC courses and obtain the NCRC/EIF certificates, although we did not detect any gender differences in program completion rates. Female participants were significantly more likely to transfer to a four-year institution than their male counterparts.

Results for Veteran and TAA-eligible participants are of particular interest, given the program's focus on these populations. No statistically significant differences were detected between

Veteran and other participants in taking ASC-GIEC courses, certificate attainment, program completion, or transfers. However, TAA-eligible participants did not perform as well as others. They were significantly less likely than the rest of the participant population to take career readiness and industry fundamentals courses, attain certificates, or complete their program of study.

Finally, we compared program completion and transfer rates between ASC-GIEC study participants and the other CTE students. Descriptive analyses show that about one in every four ASC-GIEC participants completed their degree program, compared with just over one in six of the other CTE students. About 8 percent of both groups transferred to a four-year institution. Regression analyses showed that, controlling for other characteristics, ASC-GIEC participants were more likely to complete their program than the other CTE students who shared the same demographic characteristics. Moreover, ASC-GIEC participants were 3.8 percent less likely to transfer. Although these analyses do not constitute impact results, they provide evidence that the ASC-GIEC program is associated with substantially higher program completion rates but lower transfer rates relative to the other CTE programs of the consortium colleges.

5. DISCUSSION

The ASC-GIEC program established six core strategies to ensure the program produced high-skilled, high-wage employment opportunities for program participants. This section reviews the degree to which the consortium achieved its goals for each of the six strategies.

5.1 Strategy 1: Accelerate progress and readiness of TAA-eligible and other workers to identify and enter energy and mining education programs and careers

Throughout the grant, recruiting TAA-eligible workers proved challenging, and by the end of program implementation, these individuals made up a relatively small portion of ASC-GIEC participants. In this respect, the ASC-GIEC program faced challenges similar to those of other TAACCCT programs – including the limited pool of TAA-eligible workers and difficulty identifying such individuals for recruitment. Additionally, consortium efforts to recruit other dislocated workers were constrained by difficulties establishing collaborative relationships with AJCs. These findings suggest that TAACCCT grantees might benefit from earlier and more wide-ranging inclusion of AJCs into grant activities and management structures.

Given these constraints in reaching the grant's target population, the consortium refocused recruitment efforts on other populations, including Veterans. This shift was intended to ensure the program recruited enough students to remain sustainable and available for TAA-eligible individuals, even if they did not constitute a large portion of the participants. This approach highlights a key challenge of TAACCCT programs; because the TAA-eligible population is small and difficult to reach, programs need to expand their recruitment efforts. This means they must design programs that meet the needs of a more diverse population, while still being responsive to the needs of displaced workers. This can pose challenges in curriculum design, course offerings, and transferability.

Another key challenge of the ASC-GIEC program was matching the supply of graduates with the demand of energy employers. Respondents noted that the initial industry partners were not able to provide enough jobs to absorb program completers. Because of the need to develop programs sustained by student enrollment and grant participation requirements, consortium colleges were unable to make dramatic changes in enrollment, but they quickly responded to the reduction in job projections by collaborating with additional employers. While some students said they would have preferred to work with the initial partners, this expansion provided internship, apprenticeship, and job opportunities to better align the number of graduates with the number of job openings. This process underscores the need for flexibility in recruitment and training among grantees, so they can be responsive to labor markets that shift throughout the course of the grant.

5.2 Strategy 2: Develop career pathways and build academic programs to provide qualified workers the skills to meet the needs of the energy and mining industries in the ASC

The partnerships established among consortium members were one of the major strengths of the ASC-GIEC program. Through close collaboration with industry partners and the CEWD, the ASC-GIEC consortium developed a competency model informed by industry needs. Throughout the implementation process, the consortium effectively mapped the CEWD Energy Competency Model to the Arizona Workplace Employability Standards, identified and closed curriculum gaps, standardized core curriculum, and worked with local employers to ensure the common foundational curriculum matched industry needs. The resulting ASC-GIEC model provided opportunities for students to earn credentials documenting their competencies and industry-relevant skills.

These collaborations also allowed the consortium to ensure that students learned to use the equipment and tools found in energy facilities. Industry partners donated equipment, allowed students access to their facilities, and informed colleges' equipment procurement. Respondents across the ASC-GIEC participant population expressed the feeling that, because of competencies and hands-on training, students were well prepared for energy-industry careers.

5.3 Strategy 3: Enhance and expand the ASC-GIEC Career Pathways model of stacked and latticed credentials with validated labor market value.

While the consortium designed a career pathway informed by industry needs, implementation was incomplete. As discussed in the outcomes study, a large portion of students did not take the foundational courses or complete the credentials associated with the foundational competencies. Therefore, many program completers may not have developed these competencies and lacked the associated stacked and latticed credentials central to the career pathways model.

The reasons for incomplete implementation highlight the challenges associated with TAACCCT grants that span multiple colleges and degree programs. The consortium colleges had a common agreement that ASC-GIEC participants would take the foundational courses and earn the associated credentials. Some of the ASC-GIEC degree requirements already included these courses, compelling the students to take them to complete their degree. However, for other degree programs, the courses were not required for completion, and the curriculum was not changed to make them required. In these cases, it was up to program staff to convince students of the benefits of taking these classes and earning credentials. The extent to which this occurred varied across colleges – a task that proved especially difficult in some of the degree programs designed for transfer to four-year institutions. For example, in some engineering programs, additional degree requirements could not be added, and it was difficult to convince students to take additional courses they saw as less applicable to their personal goals of transferring.

To address the underlying causes of issues such as this limited implementation, a number of respondents suggested that a program planning year would have been helpful for setting guidelines, obtaining buy-in, and making necessary curriculum changes.

5.4 Strategy 4: Embed and expand technology-enabled learning environments to increase access to educational opportunities

Under the grant, colleges implemented two types of technology-enabled learning. First, colleges used virtual simulations to provide students the opportunity to work hands-on with the equipment commonly found in energy facilities. Second, colleges instituted online course delivery options intended to make training more accessible to students that had jobs and/or were geographically dispersed.

The consortium successfully embedded and expanded technology-enabled learning throughout the program, and students frequently made use of these opportunities. In both the student focus groups and the web survey, participants frequently made positive comments about participating in online or hybrid courses, the use of virtual labs, and integration of online materials into courses. There was less consensus around the use of online course options. Staff often prioritized in-person course delivery when material was thought to be particularly difficult, or when students needed additional guidance. Students also noted that they appreciated in-person instruction when covering challenging topics. At the same time, a number of students said they felt online course delivery options were important for flexibility when balancing work and school. These findings underscore the challenges associated with online learning, as well as the need for utilizing the alternative options in a strategic way that increases flexibility and student access to training, without compromising comprehension of the material.

5.5 Strategy 5: Establish educational partnerships to ensure all ASC-GIEC courses, credentials, and credits are transferable among institutions

Through a process of reviewing and revising individual courses and related competencies, the colleges aligned their foundational curricula. The goal of this process was to ensure common competencies were covered throughout the ASC-GIEC degree programs and allow students to transfer among programs within the consortium. These transfer opportunities were intended to provide students with greater flexibility in when and where they took courses and expand access to the ASC-GIEC degrees. Additionally, the consortium established a transfer path between many of its degree programs and Arizona State University.

The alignment process highlights the potential difficulties of implementing a common curriculum across colleges. Despite the efforts of grantees, they were constrained by the requirements of individual colleges. All five colleges completed a gap analysis to identify and address any missing competencies. They also developed or modified foundational courses that cover the tier 1-5 competencies. However, complete alignment, including adoption of common course numbering and nomenclature, did not prove possible because of college-specific curriculum requirements.

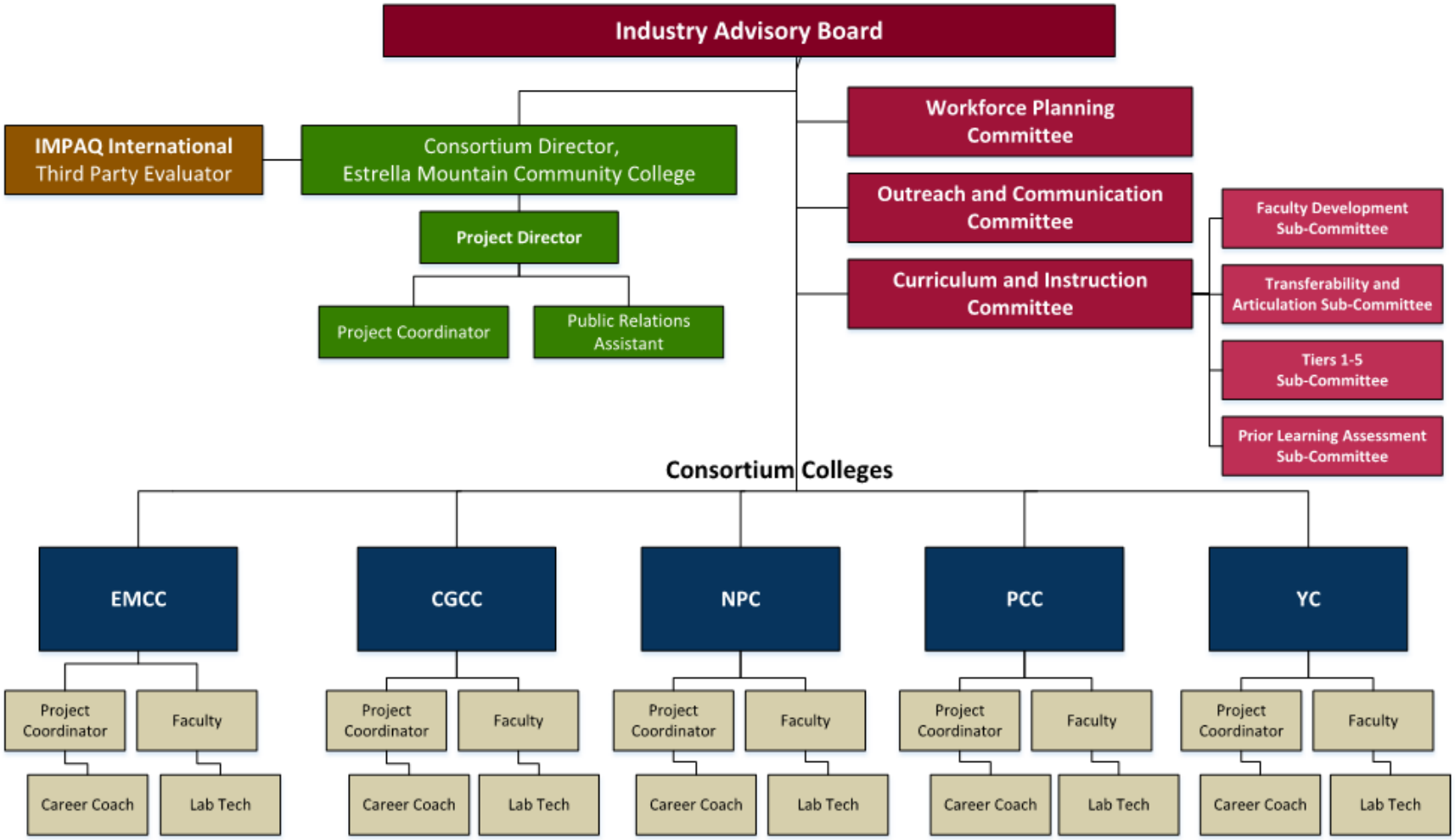
5.6 Strategy 6: Monitor and evaluate ASC-GIEC strategies to enhance program performance and achieve desired outcomes

One of the objectives of this evaluation was to produce a *quasi-experimental impact study* that would provide rigorous evidence on the effectiveness of the ASC-GIEC program to improve the educational and labor market outcomes of ASC-GIEC participants. This approach involves using statistical methods to produce a comparison group that matched the ASC-GIEC group (i.e., the treatment group) consisting of non-participants who were similar to the treatment group in both their observed characteristics and their education and labor market goals. This design would have enabled us to estimate ASC-GIEC impacts by comparing the outcomes between the treatment group of program participants and the matched comparison group of non-participants.

Unfortunately, almost all the programs that were comparable to the ASC-GIEC in areas of concentration became part of the program, leaving no plausible way of constructing a comparison group. We instead examined the outcomes of program participants relative to students at the consortium colleges who were enrolled in CTE programs at the time of the grant (which we refer to throughout the report as 'the other CTE students'). While this does not allow for a full assessment of ASC-GIEC program impacts, the outcomes assessment study is still a useful tool for deriving suggestive evidence of the overall effectiveness of the ASC-GIEC program.

Our study was also constrained by lack of available wage data, a common challenge among evaluations of TAACCCT programs. Throughout the grant period, IMPAQ and each of the consortium colleges made every effort to put a data sharing agreement in place with DES that would allow access to wage data for ASC-GIEC program participants and the other CTE students. Despite continued efforts, however, we were unsuccessful. Without access to these data, we could not provide reliable analyses of employment outcomes. Therefore, the final report's outcome findings are restricted to educational outcomes. The difficulty obtaining the necessary wage data across TAACCCT evaluations results in important limitations in understanding how TAACCCT programs influence participant outcomes.

APPENDIX A. ASC-GIEC ORGANIZATIONAL STRUCTURE



APPENDIX B. INTERVIEW PROTOCOLS

The interview protocols are intended to serve as semi-structured guides for your conversations with key faculty, staff and partners. Do not read the questions or probes word for word. Instead, adapt the wording to match the phrasing used by the respondent. Take notes on key terms or phrases used by the respondents that may be helpful in coding the interview data. Ask for clarification and definitions as needed.

Familiarize yourself with the interview protocol in advance of your meeting. Skip questions that are not relevant given the current phase of implementation. Highlight the questions you will prioritize if the respondent's time is limited. Be respectful of the respondent's time and keep the interview to the agreed length of time. We can follow up by phone or email for more information as needed.

In addition:

- Take notes during the discussion. To ensure we accurately report what is discussed during the interview, we will record this session as well. No one except the research team will have access to this recording.
- As necessary, tailor all questions to fit the individual's relationship with the GIEC.
- Keep the discussion under forty-five minutes.

INTRODUCTORY SCRIPT FOR ALL INTERVIEWS

[Introduce yourselves.] Thank you for taking the time to speak with us. This conversation will allow us to get a better understanding of the GIE program.

Before we begin, we just want to remind you that:

- *We want to focus the discussion on the GIE program and your perspective on the program.*
- *There are no right or wrong answers; we are interested your perspective and experiences.*
- *As the 3rd party evaluator, we will ensure that the information shared through these interviews remains strictly confidential; information reported to TAACCCT will be aggregated at the grant-level.*
- *We may highlight successes and challenges unique to specific colleges in the consortium, but the goal is to understand the range of implementation contexts, and not to compare the colleges to one another.*
- *Your comments will not be identified by name in any of our reports.*
- *[Name] will be taking notes during the discussion. To ensure we accurately report what is discussed during this interview, we would like to record this session as well. No one except the research team will have access to this recording.*
- *We will keep the discussion under forty-five minutes.*

May we audio-record our conversation?

[Turn on the audio recorder if the respondent has agreed to be recorded.]

College Staff/Faculty Interview Protocol

This protocol contains <u>all questions.</u>

1. BACKGROUND & CONTEXT

- What is your specific role and responsibility as it relates to the GIE program?
  - Has it changed since the beginning of the grant? *(If yes, ask for examples)*
- What will your role be after the grant period ends?
  - How will your position be funded?

2. PROGRAM MANAGEMENT, STAFF ONBOARDING, & FUNDING

- Is the program currently managed in a manner which is consistent with the original program design? *(Probe for examples, challenges/successes, etc.)*
  - In your opinion, what are the most significant changes from the original program design?
- Please describe the current status of faculty/staffing positions. *(Probe for positions that need to be filled, individuals who have left, challenges/successes, etc.)*
  - What will the staffing look like after the grant ends?
  - How will those positions that continue beyond the grant be funded?
  - Which positions will be eliminated or changed significantly?
- What would you say have been the most significant strengths associated with program management?
  - What have been the most significant challenges?
- USDOL recently extended the GIE program grant funding period. What do you foresee might be the impact of the additional six months of program implementation?

3. MARKETING & RECRUITMENT

- Please update us on the marketing and public relations activities for the GIE program. *(Probe for examples, target populations, challenges/successes.)*
  - How has grant funding been used to support outreach and recruitment over the course of the grant? *(Probe about changes in emphasis/activities from Y1, Y2, and Y3.)*
  - Has the population originally targeted by the grant changed? If so, why? *(Probe on TAA-eligible/dislocated workers)*

- Have you done any outreach specifically aimed at attracting more female applicants?

- Do you work with partners when conducting outreach? *(If yes, ask for examples)*
- What kind of outreach and recruitment will continue after the grant has expired?
  - How will these activities be funded?
  - How will the amount of outreach change after the grant funding is gone?
- Looking back over the grant, are there any types of outreach that haven't been done that you think would have been beneficial?
- What would you say have been the most significant strengths of the program's marketing and recruitment approach? What have been the most significant challenges?

4. PARTICIPANT ENROLLMENT, RETENTION & PLA POLICY

- Have there been any changes to the enrollment process since the last time we spoke? *(Probe for examples, challenges/successes, etc.)*
- Please briefly describe the PLA policy at your college. What previous activities can be counted for academic credit as part of the PLA process? *(Probe for work, military, or life experiences, PLA utilization among faculty/students, and suitability)*
  - How was it decided which kinds of prior learning/experience would be counted toward credit and which kinds would not be counted?
- What kinds of guides or resources are available for students who plan to transfer to four-year colleges? *(Probe for number of students who have transferred or taken classes at another school.)*
  - Is the transfer option relevant to GIE students at your college?
  - Which GIE programs produce the most transfer students?
  - To which colleges/universities to GIE students typically transfer?
  - Into which degree programs do they typically transfer?
  - What are the biggest challenges GIE students face when trying to transfer?
  - How do you track transfer students outcomes?
  - How has the transfer rate/process changed as a result of the grant?
- Please describe the overall GIE program retention rate thus far. *(Probe for comparison to other programs, dropout rate, strategies to retain participants, etc.)*
- What would you say have been the most significant strengths of the program's enrollment and retention approach? What have been the most significant challenges?

5. CURRICULUM

- Please update us on any changes or developments in the GIE course curriculum. *(Probe for new courses, status of tiers 1-8, gap analysis etc.)*
- Please describe the technology enabled learning available at your community college. *(Probe for virtual labs, e-text books, recorded lectures, self-paced training modules, etc.)*
    - Are students provided with any other opportunities to work with the kinds of equipment they'd use on the job?
- Tell us about your experience implementing the CEWD Energy Industry Competency Model. *(Probe for challenges/successes, consortium alignment, flexibility, suggestions, etc.)*
- When specifically does credentialing take place as students move through the programs? *(Probe for specific credentials and when they are offered/awarded.)*
- How does your college engage industry to ensure competencies and course curriculum remain current and relevant to the energy and mining career fields? *(Probe for examples, challenges/successes, etc.)*
    - How has the grant funding facilitated this kind of collaboration?
- How will you ensure that the curriculum remains relevant to industry needs after the grant has ended?
    - Are there any resources that will no longer be available after the grant ends?
    - How will any continued collaboration with industry be funded?
- What would you say have been the most significant strengths of the program's curriculum? What have been the most significant challenges in terms of curriculum?

6. JOB PLACEMENT SERVICES & CAREER PATHWAYS

- Please describe the current status of job placement services. (Probe for examples, changes, challenges/successes, etc.)
    - How have GIE students used the career coaching services?
    - How will the role of the career coaches change after the grant ends?
    - How will that role be funded going forward?
- Are there any new internship/apprenticeship opportunities available to students since our last visit? *(Probe for examples, context and sustainability of internships)*
    - Where do the students usually intern/apprentice?
    - What proportion of the GIE students receive internships/apprenticeships?
    - How do you track participation in internships/apprenticeships?
    - What proportion of internships/apprenticeships result in permanent employment?

- At this stage in the program, which job placement services appear to be most critical to the success of the participants?
    - How has the grant shaped the delivery of these services?
    - Are there any job placement services or resources that will no longer be available to students after the grant expires?
- How will job placement services and internship/apprenticeship opportunities be sustained beyond the life of the grant?

Kuder

(Probe for how/when students are introduced to Kuder, how often it's issued by faculty/students, enhancing retention, challenges/successes, sustainability, etc.)

- Please briefly describe the Kuder Career Planning System (KCPS) and how it is currently being used.
- Please briefly describe Kuder Coach and how it is currently being used.
- Has your community college implemented Kuder Connection to Business? Why or why not?
- How does your college use the Kuder student data tracking system?
    - How does this system inform the work of the career coaches?
- Will use of Kuder be sustained after the grant ends?
    - How will the use of Kuder be funded going forward?

ACT WorkKeys

(Probe for how/when students are introduced to ACT WorkKeys, how often it's issued by faculty/students, challenges/successes, sustainability, etc.)

- Please briefly describe the ACT WorkKeys Internet-Based Assessment System and how it is currently being used.
    - How will this assessment system be used after the grant has expired?
    - How will the use of this system be funded going forward?
- Please briefly describe the ACT RegiSTAR reporting and how it is currently being used.
    - How will this reporting system be used after the grant has expired?

      How will the use of this system be funded going forward?

What would you say have been the most significant strengths of the program's job placement/career pathways services? What have been the most significant challenges?

7. PARTNERSHIPS

- Please update us on your college's partnership with the GIE consortium. (*Probe for changing roles, increase/decrease participation, successes/challenges, sustainability, etc.)*
  - How will these partnerships be sustained beyond the life of the grant?
  - Will the colleges still work together on various items or will it be up to the individual colleges themselves?
- Please update us on your college's partnership with local workforce systems. (*Probe for changing roles, increase/decrease participation, successes/challenges, sustainability, etc.)*
  - How many students come to the program from the AJCs?
  - How have the AJCs targeted TAA-eligible and dislocated workers specifically?
  - How will this partnership be sustained beyond the life of the grant?
- Please update us on your college's partnership with local employers. (*Probe for changing roles, increase/decrease participation, success/challenges, sustainability, supply/demand of students, etc.)*
  - *(Note to site visitors: See Partnership Matrix and update cells based on current status)*
- What were the greatest benefits to come out of the partnerships associated with the grant? What could have been done to improve these partnerships?

8. PROGRAM OUTCOMES & SUSTAINABILITY

- What, if any, system-level changes or changes to service delivery have come out of this grant? *(Probe for examples of improvements, innovations or utilization of new technologies, learning assessments, program delivery.)*
- Are there any plans to continue consortium activities after the grant has expired? *(Probe for communication among colleges, faculty/staff positions, partnerships with employers & CEWD, technology enabled learning tools, Kuder, WorkKeys, PLAs, etc.)*
- Who from the consortium do you expect to be in regular contact with after the grant funded activities are over? *(Probe for new relationships that came about because of the grant that will be maintained.)*
- How will the work you are doing be sustained beyond the life of the grant? *(Probe for plans to transition duties to a staff position.)*

9. PROMISING PRACTICES & LESSONS LEARNED

- Describe any areas of the GIE programs that have been particularly successful.

- Describe any areas of the GIE programs that have been particularly challenging.
- Looking back over the life of the grant, what would you do differently?
- Is there anything else about your experience with the TAACCCT grant or the GIE program you would like us to document?

Thank you for taking the time to speak with us. This discussion has been very informative and helpful. If you think of any additional information you would like for us to know, please feel free to contact me directly. [Give business card].

Employer Partner Interview Protocol

1. BACKGROUND & CONTEXT

- What is your specific role and responsibility as it relates to the GIE program?
  - Has it changed since the beginning of the grant? *(If yes, ask for examples)*
- What will your role be with regard to the GIE program after the grant period ends?
  - How will your organization/company fund your participation in GIE related activities/events?

2. MARKETING & RECRUITMENT

- How does your organization participate in the marketing and public relations activities for the GIE program? *(Probe for examples, target populations, challenges/successes.)*
  - How is your participation in such activities funded?
  - Has the population originally targeted by the grant changed? If so, why? *(Probe on TAA-eligible/dislocated workers)*
  - Have you been involved in any outreach aimed at attracting more female applicants?
- Looking back over the grant, are there any types of outreach that haven't been done that you think would have been beneficial?
- What would you say have been the most significant strengths of the program's marketing and recruitment approach? What have been the most significant challenges?

3. CURRICULUM/PROGRAM DEVELOPMENT

- Do you feel that the GIE curriculum provides students with the skills needed to succeed in jobs with employers like you? Are there any gaps in the curriculum?
- How has your organization contributed to the GIE course curriculum development? *(Probe for program design input, suggesting new credentials, curriculum review, participation in course activities such as mock interviews, etc.)*
- How does your organization help ensure competencies and course curriculum remain current and relevant to the energy and mining career fields? *(Probe for examples, challenges/successes, etc.)*
  - How has grant funding facilitated this kind of college/employer/workforce collaboration?
- How will you ensure that the curriculum remains relevant to industry needs after the grant has ended?
  - How will continued college/employer/workforce collaboration be funded?

- Please describe any technology or equipment your organization has donated to the program. *(Probe for capital equipment donations, financial donations for equipment or technology purchases, etc.)*
- Tell us about any work-based training opportunities offered by your organization. *Probe for internships, apprenticeships, work-study opportunities, etc.)*
    - Do any of these training opportunities pre-date the grant?
    - Have any of these training programs changed as a result of the grant? *(If yes, probe for examples.)*
- What would you say have been the most significant strengths of the program's curriculum? What have been the most significant challenges in terms of curriculum?

4. JOB PLACEMENT SERVICES & CAREER PATHWAYS

- What kind of GIE program related job placement services/activities does your organization participate in? *(Probe for examples, changes, challenges/successes, etc.)*
    - *Who is your main contact in the consortium about these kinds of activities?*
    - *Do you work directly with the career coach or someone else at the college?*
        - *How will that relationship change after the grant has expired?*
- Are there any new internship/apprenticeship opportunities available to GIE students since our last visit? *(Probe for examples, context and sustainability of internships)*
    - What proportion of internships/apprenticeships result in permanent employment?
- At this stage in the program, which skills/credentials acquired in the GIE program appear to be most critical to the success of the participants?
- Do you feel that local employers will be able to provide enough jobs for GIE students once they graduate?
- How will job placement services and internship/apprenticeship opportunities be sustained beyond the life of the grant?

Kuder

- Are you familiar with Kuder Connection to Business? Are you using it? If so, please describe how this service works.
    - Will use of Kuder Connect to Business be sustained after the grant ends?
    - How will this service be funded going forward?

What would you say have been the most significant strengths of the program's job placement/career pathways services? What have been the most significant challenges?

5. PROGRAM OUTCOMES & SUSTAINABILITY

- What, if any, system-level changes at your organization have come out of your participation in the GIE Consortium? *(Probe for examples of improvements, new hiring practices or HR timelines, learning assessments, training delivery.)*
- Are there any plans to continue GIE consortium activities after the grant has expired? *(Probe for communication with colleges/employers/workforce & CEWD, technology upgrades, Kuder, work-based learning, etc.)*
- How will the work your organization is doing with the college(s) be sustained beyond the life of the grant? *(Probe for plans to fund activities that were previously funded through the grant.)*

6. PROMISING PRACTICES & LESSONS LEARNED

- Describe any areas of the GIE programs that have been particularly successful.
- Describe any areas of the GIE programs that have been particularly challenging.
- Looking back over the life of the grant, what would you do differently from the beginning?
- Is there anything else about your experience with the TAACCCT grant or the GIE consortium you would like us to document?

Thank you for taking the time to speak with us. This discussion has been very informative and helpful. If you think of any additional information you would like for us to know, please feel free to contact me directly. [Give business card].

Workforce Partner Interview Protocol

1. BACKGROUND & CONTEXT

- What is your specific role and responsibility as it relates to the GIE program?
  - Has it changed since the beginning of the grant? *(If yes, ask for examples)*
- How often are you in contact with staff from the GIE consortium? *(Probe for who they're in contact with, what they discuss)*

2. MARKETING & RECRUITMENT

- How do people who come through your organization generally find out about the GIE program?
- How does your organization participate in the marketing and public relations activities for the GIE program? *(Probe for examples, target populations, challenges/successes.)*
  - How is your participation in such activities funded?
  - Have you been involved in any outreach aimed at attracting the following applicants:
    - Females?
    - TAA Workers?
    - Military?
  - Has the population originally targeted by the grant changed? If so, why? *(Probe on TAA-eligible/dislocated workers)*
  - Will you continue participating in these activities once the grant ends? If so, in what capacity?
- Looking back over the grant, are there any types of outreach that haven't been done that you think would have been beneficial?
- What would you say have been the most significant strengths of the program's marketing and recruitment approach? What have been the most significant weaknesses?

3. JOB PLACEMENT SERVICES & CAREER PATHWAYS

- What kind of GIE program related job placement services/activities does your organization participate in? *(Probe for examples, changes, challenges/successes, etc.)*
  - Who is your main contact in the consortium about these kinds of activities?
  - Do you work directly with the career coach or someone else at the college?
    - How will that relationship change after the grant has expired*?*

- At this stage in the program, which skills/credentials acquired in the GIE program appear to be most critical to the success of the participants?
- Do you feel that local employers will be able to provide enough jobs for GIE students once they graduate?
- What would you say have been the most significant strengths of the program's job placement/career pathways services? What have been the most significant challenges?

4. PROGRAM OUTCOMES & SUSTAINABILITY

- How will the work your organization is doing with the college(s) be sustained beyond the life of the grant? *(Probe for plans to fund activities that were previously funded through the grant.)*

5. PROMISING PRACTICES & LESSONS LEARNED

- Describe any areas of the GIE programs that have been particularly successful.
- Describe any areas of the GIE programs that have been particularly challenging.
- Looking back over the life of the grant, what would you do differently from the beginning?
- Is there anything additional you feel the GIE program could have provided to help your organization better serve its customers?
- Is there anything else about your experience with the TAACCCT grant or the GIE consortium you would like us to document?

Thank you for taking the time to speak with us. This discussion has been very informative and helpful. If you think of any additional information you would like for us to know, please feel free to contact me directly. [Give business card].

APPENDIX C. CODING STRUCTURE FOR QUALITATIVE DATA ANALYSIS

Qualitative Codes	
1	Assessments and Certificates
2	Basic or Soft Skills
3	Career Coach
4	CEWD
5	Challenges
6	Collaboration
7	Community Organization
8	Consortium
9	Curriculum
10	Data
11	Employer or Industry
12	Equipment
13	Former Students & Alumni
14	Goals
15	Grant Management
16	High School
17	Inter-Departmental
18	Internships, Apprenticeships & Employment
19	JTED
20	Kuder
21	Outcomes
22	Pathway Development
23	Pathway Mapping
24	Prior Learning Assessment
25	Program Development
26	Retention
27	Student
28	Student Enrollment
29	Student Follow-up or Tracking
30	Student Outreach, Recruitment and Marketing
31	Successes
32	Suggestions
33	Support Services
34	Sustainability
35	Technology Use
36	University
37	Workforce Agencies (WIBS, AJCs)
38	Workforce Development

APPENDIX D. ASC-GIEC PROGRAM PARTICIPANT WEB-BASED SURVEY

The Arizona Sun Corridor Get into Energy (GIE) program is currently seeking feedback from students regarding their experiences with the GIE program at one or more of the consortium's participating colleges: Chandler-Gilbert Community College, Estrella Mountain Community College, Northland Pioneer College, Pima Community College and Yavapai College. Because you are currently or were previously enrolled in one of the degree or certificate programs affiliated with the GIE program, you have been selected to provide feedback about your experience. Your feedback will provide valuable information to help improve the program for you and for future students.

Your responses to this survey will be confidential. We will not share or use your name, address, or any other identifying information in reports or other materials related to this study. We will not identify any survey respondents by name. Your responses will be pooled with responses from other program participants and described as aggregate or grouped data only. All data related to this survey are stored and processed in an electronic format with password protected access. There are no risks expected or associated through involvement in these activities. The information gathered through this survey will be used to improve the program for participants. This online survey will take less than 30 minutes to complete. Your participation in this survey is voluntary. If you decide to participate in the survey, you may withdraw at any time. If you decide not to participate in this study or if you withdraw from participating at any time, you will not be penalized.

If you have any questions about the research study or the Get Into Energy program, please contact Heather Weber, Consortium Director at (623) 935-8583, or heather.weber@estrellamountain.edu. This research has been reviewed according to Yavapai College's, Maricopa Community Colleges', Northland Pioneer College's, and Pima Community College's Institutional Review Board procedures for research involving human subjects. If you have any questions regarding your rights as a research subject, or if problems arise which you do not feel you can discuss with the Investigator, please contact the Maricopa Community College Institutional Review Board Office at 480-731-8701, the Northland Pioneer College Institutional Review Board at 928-532-6133, the Pima Community College Institutional Review Board at 520-206-4934, or the Yavapai College Human Subjects Review Board at 928-776-2205.

Would you like to participate in the survey?
Clicking yes indicates that you have read the information on the previous pages, voluntarily agree to participate, and are at least 18 years of age.

- ❑ Yes, I would like to participate. 01→ Q1
- ❑ No, I decline to participate. 02→ CL1

OVERVIEW

First, we have a few questions about the colleges you may have attended in Arizona.

Q1. Where have you taken college courses? (*Check all that apply*)

- ❑ Chandler-Gilbert Community College **01**
- ❑ Estrella Mountain Community College **02**
- ❑ Northland Pioneer College **03**
- ❑ Pima Community College **04**
- ❑ Yavapai College **05**
- ❑ None of the above **06→ CL1**
- ❑ Blank/Refused **99→ CL1**

IF Q1 has more than one response, GO TO Q2b, ELSE GO TO

Q2a. Are you <u>currently</u> a student at [Q1]?

- ❑ Yes **01→Q3**
- ❑ No **02→ Q3**
- ❑ Blank/Refused **99→ Q3**

GO TO Q3

Q2b. Are you currently a student at any of the schools below?

PROGRAMMER NOTE: LIST ALL RESPONSES SELECTED IN Q1

- ❑ Q1 answer **01→ Q3**
- ❑ Q1 answer **02→ Q3**
- ❑ No **03→ Q3**
- ❑ Blank/Refused **99→ Q3**

GO TO Q3

ENROLLMENT IN THE GET INTO ENERGY PROGRAM

You were identified as being currently or previously enrolled in a degree or certificate program affiliated with the Get into Energy (GIE) program. The GIE program includes the following majors and certifications:

- AAS Applied Pre-Engineering
- AAS Building and Construction Technology (EUT Concentration)
- AAS Electrical Instrumentation Technology
- AAS Electric Utility Design Technology
- AAS Electrical Utility Technology
- AAS Engineering Technology
- AAS Industrial Maintenance and Operations
- AAS Information Technology and Power Systems Security
- AAS Mechatronics Engineering Technology
- AAS Power Plant Technology
- AAS Welding
- Certificate Electric Utility Technology
- Certificate of Applied Science
- Certificate: Industrial Maintenance and Operations
- Certificate: Welding

The next few questions are about your enrollment in the GIE program.

Q3. Which of the following best describes your current status in the GIE program?

❑ I am currently enrolled in the program	**01→ Q3a**
❑ I have completed the program	**02→ Q3a**
❑ I left the GIE program prior to completion	**03→ Q3a**
❑ I was never enrolled in a degree or certificate program affiliated with the GIE program	**04 →CL1**
❑ Blank/Refused	**99→CL1**

Q3a. What degree or certificate from the GIE program [IF Q3=01, LIST "are you pursuing"; IF Q3=02, LIST "did you earn"; IF Q3=03, LIST "were you pursuing"]? Check all that apply.

DROP DOWN BOX WITH DEGREES LISTED BELOW

• AAS Electrical Instrumentation Technology	01
• AAS Electric Utility Design Technology	02
• AAS Electrical Utility Technology	03
• AAS Engineering Technology	04
• AAS Industrial Maintenance and Operations	05
• AAS Information Technology and Power Systems Security	06
• AAS Mechatronics Engineering Technology	07
• AAS Power Plant Technology	08
• CCL Electric Utility Technology	09
• Certificate of Applied Science	10
• Certificate: Industrial Maintenance and Operations	11
• Certificate: Welding	12
• AAS Applied Pre-Engineering	13
• AAS Building and Construction Technology (EUT Concentration)	14
• AAS Welding	15
• Undecided	16

IF Q3=02, GO TO Q3b.
IF Q3=01, GO TO Q4.
IF Q3=03, GO TO Q3e.

Q3b. After you finished the program, did you transfer to a four-year institution?

❑ Yes	**01→ Q3c**
❑ No, but I plan on transferring four-year institution	**02→ Q3c**
❑ No, I do not plan on transferring to a four-year institution	**03→ Q4**
❑ Blank/Refused	**99→ Q4**

Q3c. What institution [IF Q3b=01, LIST "did you"; IF Q3b=02, LIST "will you"] transfer to?

_____

GO TO Q3d.

Q3d. [IF Q3b=01, LIST "Are you pursuing"; IF Q3b=02, LIST "Will you pursue"] a degree in an energy or mine-related field? [1]

- ❑ Yes **01**
- ❑ No **02**
- ❑ I am undecided **98**
- ❑ Blank/Refused **99**

GO TO Q4

Q3e. What is the primary reason you decided to leave the GIE program?

- ❑ I entered the workforce **01**
- ❑ I completed the coursework I had intended to complete **02**
- ❑ I decided on a different major **03**
- ❑ I transferred to another college **04**
- ❑ I decided to leave college **05**

GO TO Q4

- ❑ I was dissatisfied with the GIE program **06→ Q3f**
- ❑ Other (please specify) _____ **07→ Q4**
- ❑ Blank/Refused **99→ Q4**

Q3f. For which of the following reasons were you dissatisfied with the GIE program? ***(Check all that apply)***

- ❑ It didn't address my training needs **01**
- ❑ It wasn't flexible enough to fit in my schedule **02**
- ❑ Lack of hands-on learning opportunities **03**
- ❑ Quality of instruction **04**
- ❑ Other (please specify) _____ **05**
- ❑ Blank/Refused **99**

GO TO Q4

Q4. Which of the following best describes your reason for initially taking classes in the GIE program?

- ❑ Taking classes with the intention of obtaining a degree or certificate but NOT transferring to a 4 year college. **01**
- ❑ Taking classes with the intention of obtaining a degree or certificate AND transferring to a 4 year college. **02**
- ❑ Taking classes to obtain job skills but not intending to obtain a degree or certificate. **03**
- ❑ Currently enrolled in a college not affiliated with the GIE program but taking classes in the GIE program to transfer credits. **04**
- ❑ Other (please specify)_____ **05**
- ❑ Blank/Refused **99**

GO TO Q5.

Q5. Did any of the following influence your initial decision to enroll in the GIE program? *(Check all that apply)*

- ❑ Information provided by the GIE program about career opportunities in the energy and mining sectors **01**
- ❑ The opportunity to attain multiple industry-recognized credentials through the program **02**
- ❑ The flexibility to take classes online or through distance learning **03**
- ❑ The flexibility to take classes at a variety of colleges affiliated with the GIE program **04**
- ❑ The opportunity to have prior academic credits, certifications, and/or military experience reviewed to determine whether they could be counted for academic credit in the GIE program **05**
- ❑ The ease of applying credits earned in the GIE program toward engineering or energy-related degrees at Arizona State University **06**
- ❑ None of the above **07**
- ❑ Blank/Refused **99**

GO TO Q6

EXPERIENCES IN THE PROGRAM

Now we have some questions about your experiences in the program. Your answers can help provide valuable information that can be used to improve the program for yourself and future students.

Q6. Upon enrolling in the GIE program, were your prior academic credits, certifications, and/or military experience reviewed to determine whether they could be counted for academic credit in the GIE program?

- ❑ Yes **01→ Q6a**
- ❑ No **02→ Q7**
- ❑ I did not have any prior academic credits, certifications, and/or military experience **03→Q7**
- ❑ Blank/Refused **99 → Q7**

Q6a. Were your prior academic credits, certifications, and/or military experience counted for academic credit in the GIE program?

- ❑ Yes **01→ Q7**
- ❑ No **02→ Q7**
- ❑ Blank/Refused **99 →Q7**

Q7. Which of the following types of classes have you taken within the GIE program? (*Check all that apply*)

❑ Courses in a traditional classroom setting (including classrooms on and off campus)	**01**	**GO TO Q8**
❑ Online courses	**02**	
❑ Hybrid courses (include both a traditional classroom component as well as online components)	**03**	
❑ Courses that exclusively include on-site training outside of the classroom	**04**	
❑ Blank/Refused	**99→ Q8**	

Q8. In the courses you've taken as a part of the GIE program, how frequently have each of the following learning tools been used?

Learning tool:	In almost all of my courses 01	In most, but not all of my courses 02	In less than half of my courses 03	None of my courses 04
Virtual computer simulations	❑	❑	❑	❑
E-books	❑	❑	❑	❑
Podcasts	❑	❑	❑	❑
Online training modules	❑	❑	❑	❑

IF ALL Q8 =04, GO TO Q9, ELSE GO TO Q8a.

Q8a. Thinking of how well these tools help to illustrate the concepts discussed in your class, please rate each tool's usefulness on the following scale:

PROGRAMMER NOTE: Include only those tools for which Q8 ≤03. If none were selected in Q8, include all.

Learning tool:	Not at all Useful 01	Somewhat Useful 02	Very Useful 03	Not Applicable 97
Virtual computer simulations	❑	❑	❑	❑
E-books	❑	❑	❑	❑
Podcasts	❑	❑	❑	❑
Online training modules	❑	❑	❑	❑

GO TO Q9.

Q9. **As part of the GIE program, in which of the following types of out-of-the-classroom training have you participated? (Check all that apply)**

❑ Internship	**01**	**GO TO Q9a**
❑ Apprenticeship	**03**	
❑ On-the-job training	**04**	
❑ Other (please specify) _____	**06**	
❑ None	**07→ Q10**	
❑ Blank/Refused	**99→ Q9a**	

Q9a. **Thinking of how important these training experiences are to developing the skills necessary for a career in the energy or mining sectors; please rate each training experience on the following scale:**

PROGRAMMER NOTE: Include only tools for selected in Q9. If Q9 = 99, include all.

Learning tool:	Not at all Important 01	Somewhat Important 02	Very Important 03	Not Applicable 97
Internship	❑	❑	❑	❑
Apprenticeship	❑	❑	❑	❑
On-the-job training	❑	❑	❑	❑
Other	❑	❑	❑	❑

Q10. **While enrolled in the GIE program, have you received career guidance from any of the following? (*Check all that apply*)**

❑ Campus career center	**01**	**IF Q3 = 02, GO TO Q10a, ELSE GO TO Q11**
❑ Instructors	**02**	
❑ Current employer	**03**	
❑ GIE career coach	**04**	
❑ Industry professionals	**05**	
❑ None	**06→ Q11**	
❑ Blank/Refused	**99→ Q11**	

Q10a. Thinking of the career guidance you received, how important was it in helping you achieve your career goals, please rate the guidance you received on the following scale:

PROGRAMMER NOTE: Include only tools for selected in Q10.

Career Guidance	Not at all Important 01	Somewhat Important 02	Very Important 03	Not applicable 04
Campus career center	❑	❑	❑	❑
Instructors	❑	❑	❑	❑
Current employer	❑	❑	❑	❑
GIE career coach	❑	❑	❑	❑
Industry professionals	❑	❑	❑	❑

GO TO Q11.

Q11. Which of the following credentials have you earned through the GIE program? (Check all that apply)

❑ Energy Industry Employability Skills Certificate	**01**
❑ National Career Readiness Certificate	**02**
❑ Energy Industry Fundamentals Certificate	**03**
❑ AAS degree	**04**
❑ NUCP certificate	**05**
❑ None of the above	**06**

GO TO Q12

❑ Blank/Refused	**99→ Q12**

Q12. Have you received any additional certifications or licensures from sources other than the GIE program?

❑ Yes	**01→ Q12a**
❑ No	**02→ Q13**
❑ Blank/Refused	**99→ Q13**

Q12a. What certifications or licensures have you received? _____

GO TO Q13

Q13. In regard to your experience in coursework and training activities associated with the GIE program, please rate your agreement with the following statements:

Statements	Strongly Agree 01	Agree 02	Neutral 03	Disagree 04	Strongly Disagree 05	N/A 97
I had the opportunity to work with the actual tools and apparatus found in local energy and mining plants and facilities.	❑	❑	❑	❑	❑	❑
Program requirements are clear and reasonable.	❑	❑	❑	❑	❑	❑
I have learned what I expected to learn in the program.	❑	❑	❑	❑	❑	❑
Instruction is relevant to students with various levels of experience.	❑	❑	❑	❑	❑	❑
Instructors provide high quality instruction.	❑	❑	❑	❑	❑	❑
The available equipment and facilities are sufficient and well maintained.	❑	❑	❑	❑	❑	❑
Classes are offered at a convenient time.	❑	❑	❑	❑	❑	❑
I have found the support services (e.g. tutoring, financial aid, career counseling, etc.) to be adequate.	❑	❑	❑	❑	❑	❑
It is convenient for students to take classes at other campuses that are part of the GIE program.	❑	❑	❑	❑	❑	❑
[ASK IF Q3≠02 or 03] I am confident that I will be able to find employment upon completing the program.	❑	❑	❑	❑	❑	❑
For students looking to transfer to a four year institution, there is sufficient information provided about how to transfer credits.	❑	❑	❑	❑	❑	❑

GO TO Q14.

EMPLOYMENT

Now we'd like to briefly ask you about your current and previous employment.

Q14. Which of the following best describes your current employment status?

- ❑ Employed — **01→ Q14a**
- ❑ Unemployed, seeking full-time paid employment — **02**
- ❑ Unemployed, seeking part-time paid employment — **03**
- ❑ Unemployed, not seeking paid employment — **04**

GO TO Q21a

- ❑ Blank/Refused — **99→ Q21a1**

Q14a. How many hours do you work in a typical week? ***If you work a non-standard schedule, please provide your hours in a one-week average.*** **_____**

GO TO Q15

Q15. For how many years have you been in this position?

- ❑ Less than 1 year — **01**
- ❑ 1 year to less than 3 years — **02**
- ❑ 3 years to less than 5 years — **03**
- ❑ 5 years or more — **04**

GO TO Q16

- ❑ Blank/Refused — **99 → Q16**

Q16. What is your pay for this position? (Please enter an hourly wage or annual salary amount)

$_____ → Q16a

- ❑ Refused — **99→ Q17**

Q16a. Is this an hourly wage or your annual salary amount?

- ❑ Hourly wage — **01→ Q17**
- ❑ Annual salary amount — **02→ Q17**
- ❑ Other (please specify) — **03→ Q17**

Q17. Are you currently working in the energy or mining industry?

- ❑ Yes — **01→ Q18**
- ❑ No — **02→ Q18**

- ❑ Blank/Refused — **99→ Q18**

Q18. What is the zip code of your current employer?

_____

- ❑ Don't know — **98**

GO TO Q19

Q19. Regarding your current job, please rate your agreement with the following statements:

Statements	Strongly Agree 01	Agree 02	Neutral 03	Disagree 04	Strongly Disagree 05	N/A 97
In my job, I frequently use what I learn in my GIE training and coursework.	❑	❑	❑	❑	❑	❑
Networks with people I encountered in the GIE program have helped me get a new position or advance in a current position.	❑	❑	❑	❑	❑	❑

Q20. What impact has your participation in the GIE program had on your employment to date? (*Check all that apply*)

❑	I have received a promotion as a result of my training.	**01**
❑	I have received a pay raise as a result of my training.	**02**
❑	I have taken a new job as a result of my training.	**03**
❑	I feel more prepared to get a new job as a result of my training.	**04**
❑	Other (please specify) _____	**05**
❑	No impact on employment to date.	**06**

GO TO Q21

❑ Blank/Refused **99→ Q21**

Q21. Were you employed at any point within the year prior to enrolling the Get into Energy (GIE) program?

❑ Yes **01→ Q21a**
❑ No **02→ Q22**

❑ Blank/Refused **99→ Q22**

Q21a. Was this job with your current employer?

❑ Yes **01→ Q21c**
❑ No **02→ Q21b**

❑ Blank/Refused **99→Q21b**

Q21a1 Were you employed at any point within the year prior to enrolling into the GIE program?

❑ Yes **01→ Q21b**
❑ No **02→ Q22**

❑ Blank/Refused 99→ Q22

Q21b. Was this job in a trade or manufacturing industry?

- ❑ Yes **01→ Q21c**
- ❑ No **02→ Q21c**
- ❑ Blank/Refused **99→ Q21c**

Q21c. Was this position full-time or part-time [IF Q21a = 01, LIST "prior to entering the GIE program"]?

- ❑ Full-time **01→ Q21d**
- ❑ Part-time **02→ Q21d**
- ❑ Blank/Refused **99→ Q21d**

Q21d. For how many years had you been in this position upon entering the GIE program?

- ❑ Less than 1 year **01→ Q21e**
- ❑ 1 year to less than 3 years **02→ Q21e**
- ❑ 3 years to less than 5 years **03→ Q21e**
- ❑ 5 years or more **04→ Q21e**
- ❑ Blank/Refused **99→ Q21e**

Q21e. What was your pay for this position [IF Q21a = 01, LIST "prior to entering the GIE program"]? (*Please enter an hourly wage or annual salary amount*)

$_____ → Q21f

- ❑ Refused **99→ Q22**

Q21f. Was this an hourly wage or your annual salary amount?

- ❑ Hourly wage **01→ Q22**
- ❑ Annual salary amount **02→ Q22**
- ❑ Other **03→ Q22**

OVERALL EXPERIENCE WITH GIE

This last section asks about your overall experiences with the GIE program from enrollment to graduation.

Q22. Thinking of your overall experiences with the GIE program, please rate your agreement with the following statements:

Statements	Strongly Agree 01	Agree 02	Neutral 03	Disagree 04	Strongly Disagree 05	N/A 97
I would recommend the GIE program to friends and/or family interested in careers in the energy or mining sectors.	❑	❑	❑	❑	❑	❑
Overall, I am satisfied with the GIE program.	❑	❑	❑	❑	❑	❑

GO TO Q23.

Q23. Thinking about your time in the GIE program, what would you say have been the *most helpful* experiences in preparing you for employment in the energy or mining sector?

1. _____
2. _____
3. _____

GO TO Q24.

Q24. Thinking about your time in the GIE program, what would you say have been the *least helpful* experiences in preparing you for employment in the energy or mining sector?

1. _____
2. _____
3. _____

GO TO Q25

Q25. What could the GIE program do to make it more useful to future students?

_____

_____

_____

GO TO THANK YOU

THANK YOU

Thank you for providing your feedback. Your answers will be used in combination with others to evaluate the effectiveness of the Get into Energy (GIE) program and make any needed improvements. You will be receiving your $20 check in the mail within 3 – 5 weeks.

TY1. We currently have your mailing address listed as [PULL ADDRESS FROM PARTICIPANT DATA FILE]. Is this correct?

- ❑ Yes 01→ **TY2**
- ❑ No 02→ ***TY1a***

TY1a. Please provide the address where you would like your check to be mailed.

Street Address: _____

City, State: _____

Zip Code: _____

TY2: Thank you and have a good day.

CLOSING (FOR NON-ELIGIBLE RESPONDENTS)

CL1. We appreciate your interest in our survey. Unfortunately, you don't qualify to continue with the survey. Thank you for your time.

APPENDIX E. ASC-GIEC PARTICIPANT WEB SURVEY RESULTS

Exhibit E1. Student Status

Are you currently a student at a school within the ASC-GIE consortium?	
Yes	83% (N = 340)
No	17% (N = 71)

Note: Number of responses is in parentheses. Percentages are of total completed responses and may not sum to 100 percent due to rounding.

Exhibit E2. Degree or Certificate

What degree or certificate from the ASC-GIEC program are you pursuing/were you pursuing? (Check all that apply)	
AAS Applied Pre-Engineering	4% (N = 16)
AAS Building and Construction Technology (EUT Concentration)	2% (N = 10)
AAS Electrical Instrumentation Technology	8% (N = 31)
AAS Electric Utility Design Technology	3% (N = 12)
AAS Electrical Utility Technology	11% (N = 46)
AAS Engineering Technology	2% (N = 8)
AAS Industrial Maintenance and Operations	12% (N = 50)
AAS Information Technology and Power Systems Security	3% (N = 11)
AAS Mechatronics Engineering Technology	6 (N = 24)
AAS Power Plant Technology	23% (N = 92)
AAS Welding	3% (N = 12)
CCL Electric Utility Technology	7% (N = 29)
Certificate of Applied Science	17% (N = 67)
Certificate of Industrial Maintenance and Operations	4% (N = 16)
Certificate of Welding	17% (N = 71)
Undecided	8% (N = 34)

Note: Number of responses is in parentheses. Percentages are of total completed responses and the total percentage may be greater than 100% because respondents were able to select more than one option.

Exhibit E3. Reason for Initially Taking ASC-GIEC Classes

Which of the following best describes your reason for initially taking classes in the ASC-GIEC program?	
Taking classes with the intention of obtaining a degree or certificate but NOT transferring to a four-year college.	53% (N = 215)
Taking classes with the intention of obtaining a degree or certificate AND transferring to a four-year college.	29% (N = 118)
Taking classes to obtain job skills but not intending to obtain a degree or certificate.	10% (N = 39)
Other	8% (N = 31)

Note: Number of responses is in parentheses. Percentages are of total completed responses and may not sum to 100 percent due to rounding.

Exhibit E4. Decision to Enroll

Did any of the following influence your initial decision to enroll in the ASC-GIEC program? (Check all that apply)	
Information provided by the ASC-GIEC program about career opportunities in the energy and mining sectors	56% (*N* = 185)
The opportunity to attain multiple industry-recognized credentials through the program	60% (*N* = 197)
The flexibility to take classes online or through distance learning	18% (*N* = 61)
The flexibility to take classes at a variety of colleges affiliated with the ASC-GIEC program	14% (*N* = 46)
The opportunity to have prior academic credits, certifications, and/or military experience counted for academic credit	20% (*N* = 66)
The ease of applying credits earned in the ASC-GIEC program toward engineering or energy-related degrees at Arizona State University	17% (*N* = 56)
None of the above	18% (*N* = 72)

Note: Number of responses is in parentheses. Percentages are of total completed responses and the total percentage may be greater than 100% because respondents were able to select more than one option.

Exhibit E5. Prior Learning Assessment

Upon enrolling in the ASC-GIEC program, were your prior academic credits, certifications, and/or military experience reviewed to determine whether they could be counted for academic credit in the ASC-GIEC program?	
Yes	47% (*N* = 186)
No	21% (*N* = 84)
I did not have any prior academic credits, certifications, and/or military experience.	32% (*N* = 129)

Note: Number of responses is in parentheses. Percentages are of total completed responses and may not sum to 100 percent due to rounding.

Exhibit E6. Academic Credit and Prior Learning Assessment

Were your prior academic credits, certifications, and/or military experience counted for academic credit in the ASC-GIEC program?	
Yes	75% (*N* = 139)
No	25% (*N* = 47)

Note: Number of responses is in parentheses. Percentages are of total completed responses and may not sum to 100 percent due to rounding.

Exhibit E7. Class Format

Which of the following classes have you taken within the ASC-GIEC program? (Check all that apply)	
Courses in a traditional classroom setting	82% (*N* = 329)
Online courses	23% (*N* = 93)
Hybrid courses (include both a traditional classroom component as well as online components)	34% (*N* = 135)
Courses that exclusively include on-site training outside of the classroom	23% (*N* = 91)

Note: Number of responses is in parentheses. Percentages are of total completed responses and the total percentage may be greater than 100% because respondents were able to select more than one option.

Exhibit E8. Technology-Enabled Learning

In the courses you've taken as part of the ASC-GIEC program, how <u>frequently</u> have each of the following learning tools been used?				
	In almost all of courses	**Most, but not all courses**	**Less than half of courses**	**No courses**
Virtual computer simulations	13% (*N* =50)	14% (*N* =54)	28% (*N* = 107)	44% (*N* = 168)
E-books	17% (*N* = 66)	17% (*N* = 63)	22% (*N* = 85)	44% (*N* = 165)
Podcasts	2% (*N* = 8)	3% (*N* = 12)	12% (*N* = 43)	83% (*N* =306)
Online training modules	26% (*N* = 102)	22% (*N* = 86)	28% (*N* = 1100)	23% (*N* = 90)

Note: Number of responses is in parentheses. Percentages are of total completed responses and may not sum to 100 percent due to rounding.

Exhibit E9. Usefulness of Technology-Enabled Learning

Thinking of how well these tools help to illustrate the concepts discussed in your class, please rate each tool's usefulness.				
	Not at all useful	**Somewhat useful**	**Very useful**	**Not Applicable**
Virtual computer simulations	7% (*N* = 22)	23% (*N* = 74)	40% (*N* = 128)	30% (*N* = 94)
E-books	8% (*N* = 24)	30% (*N* = 95)	36% (*N* = 113)	27% (*N* = 84)
Podcasts	17% (*N* = 52)	14% (*N* = 44)	8% (*N* = 26)	60% (*N* = 185)
Online training modules	4% (*N* = 12)	29% (*N* = 97)	55% (*N* = 183)	12% (*N* =38)

Note: Number of responses is in parentheses. Percentages are of total completed responses and may not sum to 100 percent due to rounding.

Exhibit E10. Out-of-the-Classroom Training

As part of the ASC-GIEC program, in which of the following types of out-of-the-classroom training have you participated? (Check all that apply)	
Internship	35% (*N* = 48)
Apprenticeship	29% (*N* = 40)
On-the-job training	51% (*N* = 69)
Other	24% (*N* = 32)
None	66% (*N* = 259)

Note: Number of responses is in parentheses. Percentages are of total completed responses and the total percentage may be greater than 100% because respondents were able to select more than one option.

Exhibit E11. Career Guidance

While enrolled in the ASC-GIEC program, have you received career guidance from the following? (Check all that apply)	
Campus Career Center	39% (*N* = 123)
Instructors	78% (*N* = 248)
Current employer	21% (*N* = 67)
GIE career coach	37% (*N* = 116)
Industry Professionals	46% (*N* = 147)
None	20% (*N* = 78)

Note: Number of responses is in parentheses. Percentages are of total completed responses and the total percentage may be greater than 100% because respondents were able to select more than one option.

Exhibit E12. Credentials Earned

Which of the following credentials have you earned through the ASC-GIEC program? (Check all that apply)	
EES Skills Certificate	47% (*N* = 104)
NCRC	60% (*N* = 132)
EIF Certificate	55% (*N* = 121)
AAS degree	11% (*N* = 25)
NUCP certificate	6% (*N* = 14)
None	45% (*N* = 176)

Note: Number of responses is in parentheses. Percentages are of total completed responses and the total percentage may be greater than 100% because respondents were able to select more than one option.

Exhibit E13. Impressions of ASC-GIEC Program

In regard to your experience in coursework and training activities associated with the ASC-GIEC program, please arte your agreement with the following statements:						
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Not applicable
I had the opportunity to work with the actual tools and apparatus found in local energy and mining plants and facilities.	31% (*N* = 121)	25% (*N* = 97)	12% (*N* = 48)	8% (*N* = 31)	8% (*N* = 31)	15% (*N* = 59)
Program requirements are clear and reasonable.	46% (*N* = 178)	36% (*N* = 141)	7% (*N* = 27)	5% (*N* = 18)	4% (*N* = 16)	2% (*N* = 7)
I have learned what I expected to learn in the program.	41% (*N* = 157)	38% (*N* = 145)	12% (*N* = 47)	5% (*N* = 18)	3% (*N* = 12)	2% (*N* = 7)
Instruction is relevant to students with various levels of experience.	40% (*N* = 156)	36% (*N* = 140)	13% (*N* = 52)	5% (*N* = 21)	3% (*N* = 13)	1% (*N* = 5)
Instructors provide high quality instruction.	48% (*N* = 186)	33% (*N* = 128)	12% (*N* = 45)	4% (*N* = 14)	2% (*N* = 9)	1% (*N* = 5)
The available equipment and facilities are sufficient and well maintained.	37% (*N* = 144)	34% (*N* = 132)	15% (*N* = 58)	5% (*N* = 18)	4% (*N* = 14)	5% (*N* = 19)
Classes are offered at a convenient time.	35% (*N* = 134)	39% (*N* = 150)	15% (*N* = 58)	5% (*N* = 21)	4% (*N* = 16)	1% (*N* = 5)
I have found the support services (e.g. tutoring, financial aid, career counseling, etc.) to be adequate.	32% (*N* = 124)	33% (*N* = 128)	20% (*N* = 78)	4% (*N* = 14)	5% (*N* = 19)	6% (*N* = 22)
It is convenient for students to take classes at other campuses that are part of the ASC-GIEC program.	22% (*N* = 86)	23% (*N* = 89)	23% (*N* = 90)	8% (*N* = 29)	5% (*N* = 21)	18% (*N* = 69)
I am confident that I will be able to find employment upon completing the program.	22% (*N* = 86)	23% (*N* = 89)	23% (*N* = 90)	8% (*N* = 29)	5% (*N* = 21)	18% (*N* = 69)
For students looking to transfer to a four year institution, there is sufficient information provided about how to transfer credits.	16% (*N* = 62)	19% (*N* = 75)	25% (*N* = 98)	8% (*N* = 31)	4% (*N* = 17)	6% (*N* = 18)

Note: Number of responses is in parentheses. Percentages are of total completed responses and may not sum to 100 percent due to rounding.

Exhibit E14. Current Employment Status

Which of the following best describes your current employment status?	
Employed	71% (*N* = 271)
Unemployed, not seeking paid employment	5% (*N* = 21)
Unemployed, seeking full time paid	15% (*N* = 57)
Unemployed, seeking part time paid	9% (*N* = 35)

Note: Number of responses is in parentheses. Percentages are of total completed responses and may not sum to 100 percent due to rounding.

Exhibit E15. Hours Worked in Current Job

How many hours do you work in a typical week?	
Less than 20 hours	5% (*N* = 14)
20 to 29 hours	14% (*N* = 37)
30 to 39 hours	16% (*N* = 44)
40 hours	44% (*N* = 118)
41 or more hours	21% (*N* = 58)

Note: Number of responses is in parentheses. Percentages are of total completed responses and may not sum to 100 percent due to rounding. This question was only asked of those who are currently employed.

Exhibit E16. Time in Current Position

For how many years have you been in this position?	
Less than 1 year	31% (*N* = 85)
1 year to less than 3 years	36% (*N* = 97)
3 years to less than 5 years	13% (*N* = 36)
5 years or more	19% (*N* = 52)

Note: Number of responses is in parentheses. Percentages are of total completed responses and may not sum to 100 percent due to rounding. This question was only asked of those who are currently employed.

Exhibit E17. Working in Energy/Mining Sector

Are you currently working in the energy or mining sector?	
Yes	29% (*N* = 79)
No	71% (*N* = 191)

Note: Number of responses is in parentheses. Percentages are of total completed responses and may not sum to 100 percent due to rounding. This question was only asked of those who are currently employed.

Exhibit E18. Pay in Current Position

What is your pay for this position?	
$0 - $10,000	0% (*N* = 2)
$10,001 - $20,000	14% (*N* = 16)
$20,001 - $30,000	20% (*N* = 24)
$30,001 - $40,000	22% (*N* = 26)
$40,001 - $50,000	13% (*N* = 15)
$50,001 - $60,000	10% (*N* = 12)
$60,001 +	19% (*N* = 23)

Note: Number of responses is in parentheses. Percentages are of total completed responses and may not sum to 100 percent due to rounding. This question was only asked of those who are currently employed.

Exhibit E19. ASC-GIEC and Current Employment

Regarding your job, please rate your agreement with the following statements:						
	Strongly Agree	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**	**Not applicable**
In my job, I frequently use what I learn in my ASC-GIEC training and coursework.	14% (*N* = 38)	18% (*N* = 49)	17% (*N* = 45)	12% (*N* = 32)	18% (*N* = 48)	21% (*N* = 57)
Networks with people I encountered in the ASC-GIEC program have helped me get a new position or advance in a current position.	7% (*N* = 20)	8% (*N* = 22)	21% (*N* = 57)	16% (*N* = 42)	20% (*N* = 54)	27% (*N* = 73)

Note: Number of responses is in parentheses. Percentages are of total completed responses and may not sum to 100 percent due to rounding. This question was only asked of those who are currently employed.

Exhibit E20. Effect of ASC-GIEC on Employment

What impact has your participation in the ASC-GIEC program had on your employment to date? (Check all that apply)	
I have received a promotion as a result of my training.	6% (N = 16)
I have received a pay raise as a result of my training.	12% (N = 31)
I have taken a new job as a result of my training.	13% (N = 34)
I feel more prepared to get a new job as a result of my training.	33% (N = 90)
Other	57% (N = 153)
No impact on employment to date	5% (N = 13)

Note: Number of responses is in parentheses. Percentages are of total completed responses and the total percentage may be greater than 100% because respondents were able to select more than one option.

Exhibit E21. Employment Prior to ASC-GIEC

Were you employed at any point within the year prior to enrolling the ASC-GIEC program?	
Yes	85% (*N* = 228)
No	15% (*N* = 41)

Note: Number of responses is in parentheses. Percentages are of total completed responses and may not sum to 100 percent due to rounding.

Exhibit E22. Satisfaction with ASC-GIEC

In regard to your experience in coursework and training activities associated with the ASC-GIEC program, please rate your agreement with the following statements:						
	Strongly Agree	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**	**Not applicable**
I would recommend the ASC-GIEC program to friends and/or family interested in careers in the energy or mining sectors.	58% (*N* = 220)	30% (*N* = 115)	8% (*N* = 30)	1% (*N* = 4)	3% (*N* = 10)	1% (*N* = 3)
Overall, I am satisfied with the ASC-GIEC program.	48% (*N* = 184)	31% (*N* = 119)	12% (*N* = 44)	5% (*N* = 19)	3% (*N* = 10)	1% (*N* = 4)

Note: Number of responses is in parentheses. Percentages are of total completed responses and may not sum to 100 percent due to rounding.

APPENDIX F. CERTIFICATES AND DEGREES BY COLLEGE

College	Certificates and Degrees
EMCC	AAS Power Plant Technology
	AAS Information Technology & Power Systems Security
CGCC	AAS Engineering Technology (transfer option)
	AAS Electric Utility Design Technology
	AAS Electric Utility Technology
	AAS Applied Pre-Engineering
	CCL Electrical Utility Technology
NPC	AAS Industrial Maintenance and Operation
	AAS Mechatronics Engineering Technology
	AAS Welding
	Certificate of Applied Science
	Certificate – Industrial Maintenance and Operations
	Certificate - Welding
PCC	AAS Building & Construction Technologies (EUT Concentration)
YC	AAS Electrical Instrumentation Technology
	AAS Applied Pre-Engineering (Transfer Option)
	Certificate - Electric Utility Technology
	Certificate - Welding