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CREATING STRONG SCHOOLS & COMMUNITIES

Preparing Alaskans for Mining Careers Through Short, Industry-Informed Training Programs:

University of Alaska Round IV TAACCCT Grant

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Evaluation Report, September 2018

Executive summary

From 2014 through 2018, the University of Alaska (UA) system managed a Trade Adjustment Assistance Community College and Career Training (TAACCCT) consortium grant to develop and expand its mining job training programs. The grant supported three programs: the Mining Mill Operations Occupational Endorsement (OE) at the University of Alaska Fairbanks (UAF), Fairbanks Community and Technical College (CTC), and Prince William Sound College (PWSC); the Mining and Petroleum Training Services (MAPTS) Surface and Underground Mining programs at UAF; and the Mine Mechanic OE and Associate in Applied Sciences (AAS) program at the University of Alaska Southeast (UAS).

Alaska's TAACCCT initiative aimed to meet the mining industry's need for higher skilled, entry-level workers who are locally based Alaskans and thus more likely to stay employed and advance (Kadenic, 2015). The three program interventions served 146 students based on the theory that offering short-term, occupational-focused training programs that incorporate experiential hands-on learning with holistic academic, nonacademic, and career supports will be attractive to Alaskans, particularly those who are unemployed and underemployed adults, veterans, Alaska Natives, and workers eligible for support under the Trade Adjustment Assistance Program from the U.S. Department of Labor (Kazis et al., 2007). In turn, this engagement can promote high completion rates and acquisition of technical competencies and job-readiness skills that are valued by the state's mining industry. Each program also heavily relied on partnerships with employers who contributed to curriculum design, procurement of specialized equipment, student recruitment, student financial and career supports, and job placement. The strength of this model is shown by high completion rates (over 95 percent for the two programs that were 2 to 10 weeks in length) and positive employment results. Between 86 and 90 percent of graduates were employed after completing their program, and their average quarterly wages increased between $900 and $10,000 in the year after completing the program compared to quarterly wages in the year prior to entering the program.

This summary briefly describes the purpose and design of the initiative's evaluation, followed by an overview of how the programs were implemented and a summary of student outcomes for the MAPTS programs. It concludes with considerations for the field based on how the initiative adapted to challenges and achieved successful outcomes.

EVALUATION DESIGN

This evaluation has two main objectives. First, it provides documentation of how the initiative leveraged TAACCCT resources to achieve its proposed outcomes and fulfill the goals of the TAACCCT grant. Second, it synthesizes strategies the programs implemented to achieve positive educational and workforce outcomes that could be broadly applicable to career training programs. To deliver this knowledge to the field, Education Northwest conducted an implementation study of all three programs and an outcomes study of the MAPTS program, which provided a sufficient sample size for a quasi-experimental evaluation design. Methodological approaches for each study are briefly described below, with additional details in the main body of the report and appendices.

Implementation study

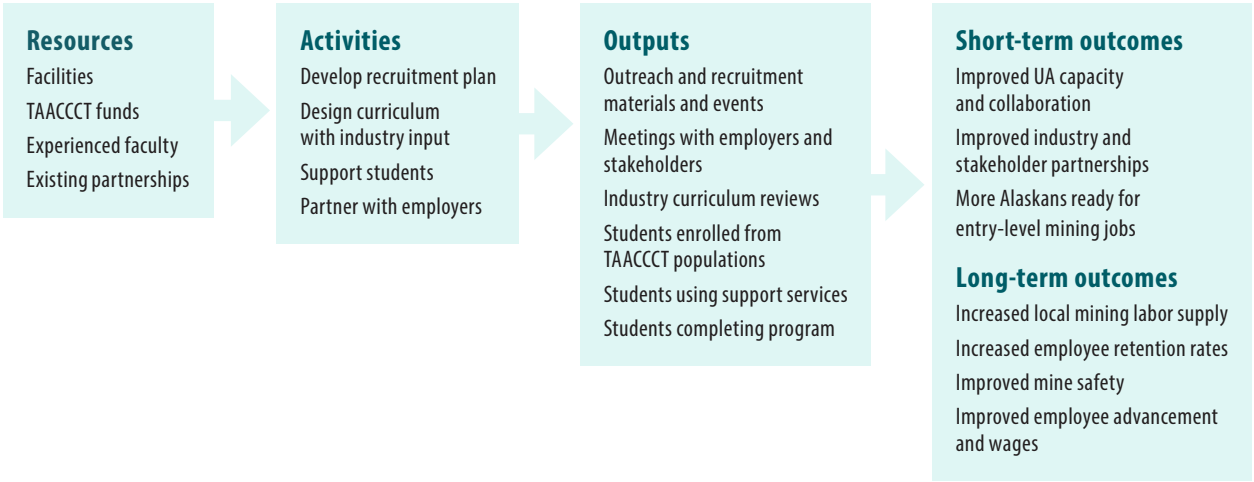
The implementation study, conducted from spring 2015 through spring, 2018, was guided by five questions:

1. How were UA TAACCCT programs and curricula designed, improved, or expanded to provide students with the necessary skills to work in the mining industry and pursue further education?
2. To what extent did the UA TAACCCT programs serve target populations, especially adult, TAA-eligible, Alaska Native, veteran, and unemployed workers?
3. What academic, career, job placement, or other supports were provided to program participants?
4. To what extent did the UA TAACCCT programs partner with local industry leaders and workforce groups in developing the curricula, securing resources, and providing supports for job preparation and placement?
5. To what extent were key strategies and activities implemented as planned?

Evaluators developed these questions based on TAACCCT evaluation guidance and each program's logic model. The logic models guided implementation efforts by linking each program's goals to the specific strategies and activities they used to accomplish them, and helped program leads track their progress using the outputs and short- and intermediate-term outcomes those activities intended to produce. The logic models similarly informed the types of evaluation data to be collected, the timeline for data collection, and methodological approaches to data collection and analysis. Initiative-wide themes from the logic models are presented in figure 1 and full logic models for each program are presented in appendix A.

Implementation evaluation activities included collecting program documents and conducting interviews, focus groups, observations, and surveys. Evaluators collected data through nine in-depth site visits and biweekly phone calls with the initiative's program manager. Data were analyzed to assess quality of implementation and capacity building across indicators in five areas: program management, curriculum and instruction, student supports and advising, participant recruitment and selection, and industry and workforce partnerships.

***Figure 1.** UA TAACCCT initiative logic model overview*



Source: Authors.

Outcomes study

The outcomes study focused exclusively on the MAPTS program since each of the other two programs had fewer than 20 completers by March 2017—a sample size that was too small to draw meaningful conclusions. The outcomes study was conducted at the end of grant activities when employment data through March of 2018 became available. Due to differences in program length and technical skills content, outcomes for Surface and Underground Mining participants were evaluated separately. Three sets of questions guided the outcomes evaluation:

1. *Program participation:* How many participants did MAPTS serve and how many completed their program?
2. *Educational attainment:* How many MAPTS participants continued their education after they completed the program, earned credits, or completed degrees?
3. *Employment outcomes:* How many MAPTS participants obtained employment after participating in the program? How do the wages and job retention rates of MAPTS participants compare to those of similar individuals who enter mining and related industries without MAPTS training?

These questions are based on the nine U.S. Department of Labor TAACCCT educational and employment targets (see appendix B). The outcomes study used postsecondary enrollment, progression, and completion data from the University of Alaska and employment and residency data from the Alaska Department of Labor and Workforce Development to address the research questions. Some demographic information was provided in both datasets and through intake forms submitted by TAACCCT participants. Evaluators addressed the first two questions with descriptive analysis and blended descriptive and quasi-experimental designs to address the third question. The program recruitment model and small sample size eliminated the feasibility of a randomized controlled trial and analytic approaches that compared trends over time within the treatment sample. A matching study using coarsened exact matching was the most rigorous analytic design possible. This quasi-experimental approach establishes a comparison group by matching MAPTS participants based on observable background characteristics to other Alaska workers who entered similar industries at the same time without MAPTS training.

The program's goals, theoretical model, and target population directed the selection of a comparison pool. It was critical to derive a matched comparison sample based on the counterfactual of entering a mining or similar job without MAPTS training. Survey and focus group data showed that most MAPTS participants were not interested in or able to pursue a longer-term or more academically rigorous degree program. Rather, they desired to enter the mining or construction workforce immediately. Thus, basing the comparison sample on college students in other programs would result in biased or inaccurate conclusions. The major limitation of this study's approach is that the workforce data used to derive the comparison sample does not include indicators of race/ethnicity or education level. Thus, this study fails to meet standards for causal evidence according to the U.S. Department of Labor Clearinghouse for Labor Evaluation and Research and leaves room for future research to corroborate this study's results.

IMPLEMENTATION STUDY FINDINGS

Key findings from the implementation study are organized by evaluation topic below.

Curriculum and instruction

- *Through a successful cross-unit collaboration, the UA TAACCCT initiative launched a unique program to meet industry needs.* UAF, CTC, and PWSC brought their own sets of expertise, technologies, facilities, and equipment to collaboratively develop the new Mining Mill Operations program. This tangible example of university-community college institutional collaboration enhanced the institutions' capacity to address an industry need for workers with a strong understanding of the mill operations process.
- *Each UA TAACCCT initiative program incorporated opportunities for authentic experiential learning.* Incorporating experiential, hands-on learning opportunities was one of the core strategies of the UA TAACCCT initiative for preparing students to successfully work in the mining industry. Each program prepared students to meet employer expectations through experiential and hands-on training that acclimated them to worksite conditions.

Serving adult, TAA-eligible, Alaska Native, veteran, and unemployed workers

- *The UA TAACCCT programs included features to meet the unique needs of TAACCCT students.* The Mining Mill Operations and MAPTS programs used condensed, intensive curricula that could be completed in 2 to 10 weeks. Additionally, the Mining Mill Operations program offered two types of program models—one 100 percent face to face in Fairbanks and the other 80 percent online and 20 percent face to face—to meet a variety of adult learning styles and scheduling needs.
- *The UA TAACCCT program leaders worked to create strong relationships with local stakeholders to recruit adult, TAA-eligible, Alaska Native, veteran, and unemployed participants.* The strategy program leaders used most often to recruit and enroll TAACCCT students was to build strong relationships with stakeholders that could refer potential students to the programs. Primary stakeholders included employers, Alaska Native and community organizations, military bases, and job centers.
- *The Mine Mechanic program attempted to create new recruitment strategies geared toward adult learners.* Program leads developed new outreach and recruitment strategies geared toward adult learners, including extensive calls and visits to different organizations, such as the juvenile justice center, job centers, veterans' groups, the State Emergency Response Commission, and the Tlingit and Haida Native organizations. Despite outreach efforts, the program lacked long-standing relationships with these groups and had limited success in recruiting adults and students from these populations.
- *MAPTS participants included Native and rural Alaska communities historically underserved by postsecondary programs.* Of the 93 individuals who participated in the MAPTS program through September 2017, 54 percent were Alaska Native and 62 percent lived outside of Alaska's urban areas.
- *Mining Mill Operations Program successfully recruited older adults and veterans.* The average age of participants was 31, and 29 percent indicated they were veterans.

Providing student supports

- *Each UA TAACCCT program provided academic supports to participants, although the approach they used and the consistency of the supports they provided varied both within and across programs.* Student supports included tutoring from faculty and staff members with specialized content knowledge; practice sessions customized to individual student needs identified through daily collection and analysis of student performance data; and coordinators to help students enroll, secure financial aid, and access academic, nonacademic, and career supports. Mining Mill Operations and MAPTS program faculty and staff members personally delivered all student supports while the Mine Mechanics program coordinator facilitated connections between students and general university resources.
- *The MAPTS program provided extensive, culturally responsive support for developing industry-relevant interpersonal skills.* The MAPTS program has a unique emphasis on supporting students to develop the personal qualities, habits, and social skills that entry-level miners need to maintain employment and advance in the industry. This instruction is tailored to the TAACCCT students they recruit, who are typically from remote rural villages and often lack formal work experience and postsecondary education. A diverse team of instructors demonstrate and provide direct instruction on working in multicultural teams, and they use culturally appropriate instructional strategies that relate job skills to students' personal experiences.
- *UA TAACCCT programs' career supports helped students transition from education and training to employment.* These supports included resume and interview workshops, visits to mines to understand the day-to-day work conditions and speak with employees and supervisors, and interactions with employers at graduation ceremonies, including formal job interviews. One program, MAPTS, also cultivates a strong alumni network and instructors continue to provide guidance to alumni for years after graduation to help them advance in their careers.

Partnering with industry, workforce, and community groups

- *All three UA TAACCCT programs relied on employer input to develop curriculum and instruction that were responsive to industry needs.* The programs frequently gathered input from Alaska mining companies on their program's structure and curriculum. They also engaged employers in instructional activities, such as delivering guest lectures, hosting field trips to mines, and providing internships to selected students. Employers provided input on instructional materials, including testing a software-based simulation training tool for the Mining Mill Operations OE and donating heavy equipment for the MAPTS programs. Employers attended graduation ceremonies for MAPTS and Mining Mill Operations students. Four to 5 major Alaskan mining corporations sent representatives to interview Mining Mill Operations graduates for open positions immediately after the ceremony for each of the three graduating classes.
- *UA TAACCCT program leaders developed three partnerships that contributed to student recruitment.* First, partnerships with employers aided the MAPTS program with marketing and recruitment, provided modest resources to help with some program costs, and in some cases

provided a conditional job offer or interview upon program completion. Second, a partnership with an Alaska Native organization helped MAPTS recruit tribal members, covered some program costs, and supplemented the program's career supports with resume and interview guidance. Finally, the Mining Mill Operations program leveraged a military connection to successfully recruit veterans from several local bases.

Partnering with industry, workforce, and community groups

- *The majority of UA TAACCCT initiative strategies and activities were implemented as planned.* The UA TAACCCT technical narrative identified several milestones that the initiative would accomplish over the course of the grant period related to program, curriculum,and instructional tool development; student recruitment; student program completion; facilities expansion; and partnership development. Most deliverables were met with no or minor modifications. One notable change to the design of the Mine Mechanic programs' facility expansion was to cancel plans to purchase a bridge crane and instead to focus funds only on the expansion of classroom and laboratory facilities. This was due, in part, to changes in construction prices between the time the TAACCCT grant proposal was written and the time the project was ready to commence.

OUTCOMES STUDY FINDINGS

MAPTS participants who completed the program by September 2017 are included in the outcomes study. An overview of MAPTS program outcomes (table 1) is followed by a description of key participation, educational attainment, and employment outcomes organized by the theme of each evaluation question.

Table 1. Education and employment outcomes for MAPTS participants

Measure	Number of Surface Mining participants	Number of Underground Mining participants
Program participation and completion		
Enrolled in the program	**32**	**61**
Retained in and completed the program[a]	**32**	**58**
Educational attainment		
Completed credit hours in the noncredit MAPTS program[b]	**0**	**0**
Earned Mining Safety and Health Administration certificate in the program	**32**	**58**
Earned a degree or credential in the noncredit MAPTS program[b]	**0**	**0**
Enrolled in further education after grant-funded program participation	**0**	**3**

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Measure	Number of Surface Mining participants	Number of Underground Mining participants
Employment outcomes		
Employed after program participation	**27**	**53**
Obtained a job in first quarter after participation and retained in employment continuously after program participation		
For six months (observable for full sample)	**14**	**38**
For one year (observable for 22 Surface Mining and 48 Underground Mining participants who participated by March 2017)	**7**	**30**
Through the first quarter of 2018 (observable for full sample)	**8**	**34**
Received a wage increase after participation if employed prior to program enrollment	**12**	**34**

[a]MAPTS programs took two weeks for Surface Mining and six weeks for Underground Mining to complete. All students who completed the program were retained until completion. No students were retained in MAPTS after completing the two- or six-week program.

[b]MAPTS does not award college credit, degrees, or credentials for the TAACCCT-funded Surface and Underground Mining programs. All completers earned a Mining Safety and Health Administration certificate, but no formal degrees or credentials were awarded through the University of Alaska Fairbanks for these noncredit programs.

Note: The outcomes listed in this table represent the nine outcomes articulated in the TAACCCT Solicitation for Grant Applications.

Source: Authors' analysis of University of Alaska and Alaska Department of Labor and Workforce Development data.

Participation and completion

- *The MAPTS program served a mix of Alaska Native, white, rural, and male students.* MAPTS served higher percentages of Alaska Native and male students than the University of Alaska Fairbanks overall and about two-thirds of participants were from outside Alaska's urban areas.
- *Most MAPTS participants successfully completed the program.* All Surface Mining participants and 58 of 61 Underground Mining participants completed the program.

Educational attainment

- *Few participants continued their education after completing a MAPTS program.* MAPTS prepares and supports students to enter the workforce directly after they complete the program. While all completers earned a Mining Safety and Health Administration certificate, none received college credit for their participation and only three students enrolled in further education after completing their MAPTS program.

Employment outcomes

- *Most MAPTS participants found employment after participating in the program.* Eighty-five percent of participants were employed within a year after completion. Half of Surface Mining participants and two-thirds of Underground Mining participants were working in either the mining or construction industries within the first four quarters after they completed their program.
- *Initial wage gains after program completion were large and statistically significantly higher than those of a matched comparison group.* Two quarters (about six months) after completion, Underground Mining students earned $6,026 more per quarter than their matched peers and Surface Mining participants earned $2,274 more per quarter than their matched peers. After four quarters, Underground Mining participants earned $7,630 more per quarter than their matched peers and Surface Mining participants earned $1,844 more per quarter than their matched peers. All results are statistically significant except for Surface Mining results after four quarters.
- *MAPTS program participations were more likely to retain employment than a matched comparison sample after two quarters, but results varied by program after four quarters.* Two quarters after program completion, Underground Mining participants were 7.4 times more likely to retain employment and Surface Mining participants were 59.2 times more likely to retain employment relative to their matched peers. After four quarters, Underground Mining participants were 9.4 times more likely to remain employed and Surface Mining participants were 1.2 times more likely to remain employed than their matched peers. All results are statistically significant except for Surface Mining results after four quarters.

Areas for future research

- *Conduct rigorous evaluations of UA TAACCCT programs and other mining career training programs.* Provided the programs are sustained, a larger number of participants could enable additional quasi-experimental designs that produce casual estimates of the programs' impacts on educational and workforce outcomes. In addition, a longer-term study of employment outcomes is important to validate the impacts of the MAPTS program.
- *Evaluate community impacts of training programs.* Providing training for and placing individuals in high-wage jobs is likely to have effects that extend beyond the individual to his or her community in terms of economic development and associated health, education, criminal justice, and other outcomes. This is especially important for programs serving target populations, such as rural or Alaska Native students, and for communities with high levels of unemployment (Gray, Hunter, & Biddle, 2014).
- *Evaluate employer impacts and return on investments.* Employers can reap many rewards from hiring employees who are trained according to industry needs and committed to working and living in state. This can include increased employee retention and productivity and even reductions in safety issues that delay work, damage equipment, or cause workplace injuries. Such studies could provide evidence of the economic value in training programs and motivate employers to partner in similar efforts.

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Introduction

From 2014 through 2018, the University of Alaska (UA) system managed a Round IV Trade Adjustment Assistance Community College and Career Training (TAACCCT) consortium grant to develop and expand its mining job training programs. The grant supported three programs: the Mining Mill Operations Occupational Endorsement (OE) program at the University of Alaska Fairbanks (UAF), Fairbanks Community and Technical College (CTC), and Prince William Sound College (PWSC); Mining and Petroleum Training Services (MAPTS) Surface Mining and Underground Mining programs at UAF; and the Mine Mechanic OE and Associate in Applied Sciences (AAS) programs.

Alaska's TAACCCT initiative aimed to meet the mining industry's need for highly skilled, entry-level workers who are locally based Alaskans and thus more likely to stay employed and advance in their careers. The three program interventions supported by the TAACCCT investment are based on the theory that offering short-term, occupational-focused college training programs that incorporate experiential learning and holistic student supports will be attractive to Alaskans, particularly those who are unemployed and underemployed adults, veterans, Alaska Natives, and workers eligible for support under the Trade Adjustment Assistance Program of the U.S. Department of Labor. In turn, this engagement promotes high completion rates and acquisition of technical competencies and job-readiness skills that are valued by the state's mining industry. The success of each of the three programs relied heavily on partnerships with employers who contributed to curriculum design, procurement of specialized equipment, student recruitment, student financial and career supports, and job placement. The strength of this model is shown by high completion rates (over 95 percent for the two programs that were 2 to 10 weeks in length) and positive employment results. Between 86 and 90 percent of graduates were employed after completing their program, and their average quarterly wages increased between $900 and $10,000 in the year after completing the program compared to quarterly wages in the year prior to entering the program.

This report assesses the implementation of the UA's TAACCCT initiative programs and examines education and employment outcomes for one program's participants. The report is divided into four sections. Section 1 describes the initiative's core strategies and provides an overview of each program's objectives and defining characteristics. Section 2 highlights key implementation findings regarding curriculum development, student recruitment, supports for students to complete the program and successfully enter the workforce, and stakeholder engagement. This section also includes a summary of the degree to which the programs' key strategies were implemented as planned. Section 3 reports educational and employment outcomes for MAPTS program participants. Finally, Section 4 describes promising practices that were enacted by these programs and may be broadly applicable to other career training programs. Section 4 ends with a description of areas that could benefit from further research.

Section 1: Overview of the University of Alaska TAACCCT initiative

The UA TAACCCT initiative targets three occupational areas: mine extractors, mill process operators, and mine mechanics. Each program aims to enhance the employability skills of TAA-eligible workers, Alaska Natives, adult students, and unemployed Alaskans to qualify them for entry-level, high-wage mining jobs and fill Alaska's demand for skilled mining workers with local labor. Alaska's universities and technical colleges that belong to the initiative leverage faculty expertise, facilities, and industry connections to prepare adults for entry-level positions in the mining sector. All three programs share three core strategies:

1. Education and training targeted and contextualized to mining-specific occupations
2. Employer and strategic stakeholder involvement in program development and implementation to enhance student success
3. Student educational instruction complemented by experiential learning opportunities, as well as enhanced academic and nonacademic supports

Table 2 summarizes notable features of the programs that are described in this section. Figure 2 provides a timeline of the major implementation milestones.

Table 2. Notable features of the UA's TAACCCT initiative programs

Program	Notable features
Mining Mill Operations Occupational Endorsement ***University of Alaska Fairbanks, Fairbanks Community Technical College, and Prince William Sound College***	• Program awards the only occupational endorsement in mill process operation in the United States. • As a collaboration between a community technical college and a university, the program provides students with both applied skills and a theoretical understanding of mill operations. • Two program delivery models—either 10 weeks of face-to-face classroom and laboratory sessions or eight weeks of online instructional modules and two weeks of intensive hands-on laboratory experience—accommodated different learning styles and student schedules. • A dynamic mill process simulator, the first of its kind, was developed to provide a more realistic training experience. • Four to five major Alaskan mining employers attended graduation ceremonies and interviewed students immediately afterwards.

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Program	Notable features
Underground Mining and Surface Mining ***Mining and Petroleum Training Services at the University of Alaska Fairbanks***	• A remote camp facility simulates a mining worksite to help students adapt to work and life conditions prior to starting a job. • Short training programs include 140 to 280 instructional hours condensed into two- or four-week sessions that include classroom instruction and practice on simulators and heavy mining equipment. • Strong partnerships with employers and Alaska Native organizations facilitate the recruitment of target populations. • Faculty with diverse backgrounds and more than 250 years of combined experience in the mining industry practice culturally responsive pedagogy and teach students strategies for working and living in a multicultural workplace. • Wraparound academic, nonacademic, and career supports for participants and alumni promote obtaining and retaining jobs.
Mine Mechanic Occupational Endorsement and Mine Mechanic Associates of Applied Sciences ***University of Alaska Southeast***	• A strong partnership with local mining company, Hecla Greens Creek, sustains the Mine Mechanics Pathway to Mining Careers program. • 11,000 square feet of remodeled indoor facilities provides hands-on laboratory experiences with heavy equipment in all seasons. • The program coordinated internships and job interviews with two regional mining companies

Source: Authors.

Mining Mill Operations Occupational Endorsement Program

The Mining Mill Operations Occupational Endorsement (OE) program is a cooperative effort between the mineral processing faculty at UAF's College of Engineering and Mines and UAF's Community and Technical College (CTC) process technology faculty. The purpose of the OE is to provide students with a strong understanding in the mill operations process, mill process equipment, and mine safety. By providing students with these specialized skills, the program intends to produce candidates qualified for entry-level miner positions and reduce the on-the-job training needed to become a mill operator. In addition, program leads developed a dynamic mill process simulator—which resembles actual mill process operations more than any existing technology—to incorporate in the program's training. The TAACCCT grant provided the seed money to design and implement the program and to develop the software for the dynamic simulator.

The 17-credit Mining Mill Operations program is situated within CTC and provides students with a conceptual understanding of the core principles and science behind the milling process. It emphasizes opportunities to learn the applied, technical aspects of the work through hands-on laboratory experience. Two program delivery models were offered in intensive, 10-week sessions.

The first two offerings, delivered entirely on the Fairbanks campus, involved half-day classroom and half-day laboratory experiences five days per week. The last offering delivered all coursework through online modules that students completed in 14 weeks. This third cohort of students then completed laboratory exercises in person in Fairbanks during the last two weeks in conditions that simulated a mining worksite, including 14 consecutive 10-hour work days and mine campsite living arrangements.

The OE program was designed so that students can obtain the skills and credential needed to get an entry-level mining job immediately after completing the program. The OE program also gives students the opportunity to continue along an educational pathway by accumulating course credits that apply to an associate degree in process technology at UAF or in the millwright program at PWSC. Likewise, students in these related associate degree programs can obtain the Mining Mill Operations OE, and in doing so will earn an additional credential without extending their time to degree completion.

Mining and Petroleum Training Services Surface and Underground Mining Programs

The Mining and Petroleum Training Services (MAPTS) Surface and Underground Mining training programs aim to equip local workers with the technical and interpersonal skills to obtain and retain employment as entry-level extractors. MAPTS began training mining students approximately one year before the UA system received the TAACCCT grant. The TAACCCT grant funded the operational costs of the program, which is delivered at a remote camp facility located approximately 130 miles southeast of Fairbanks. The facility has both an underground and a surface mine where students practice on simulators and learn to operate mining equipment, as well as classrooms and living quarters.

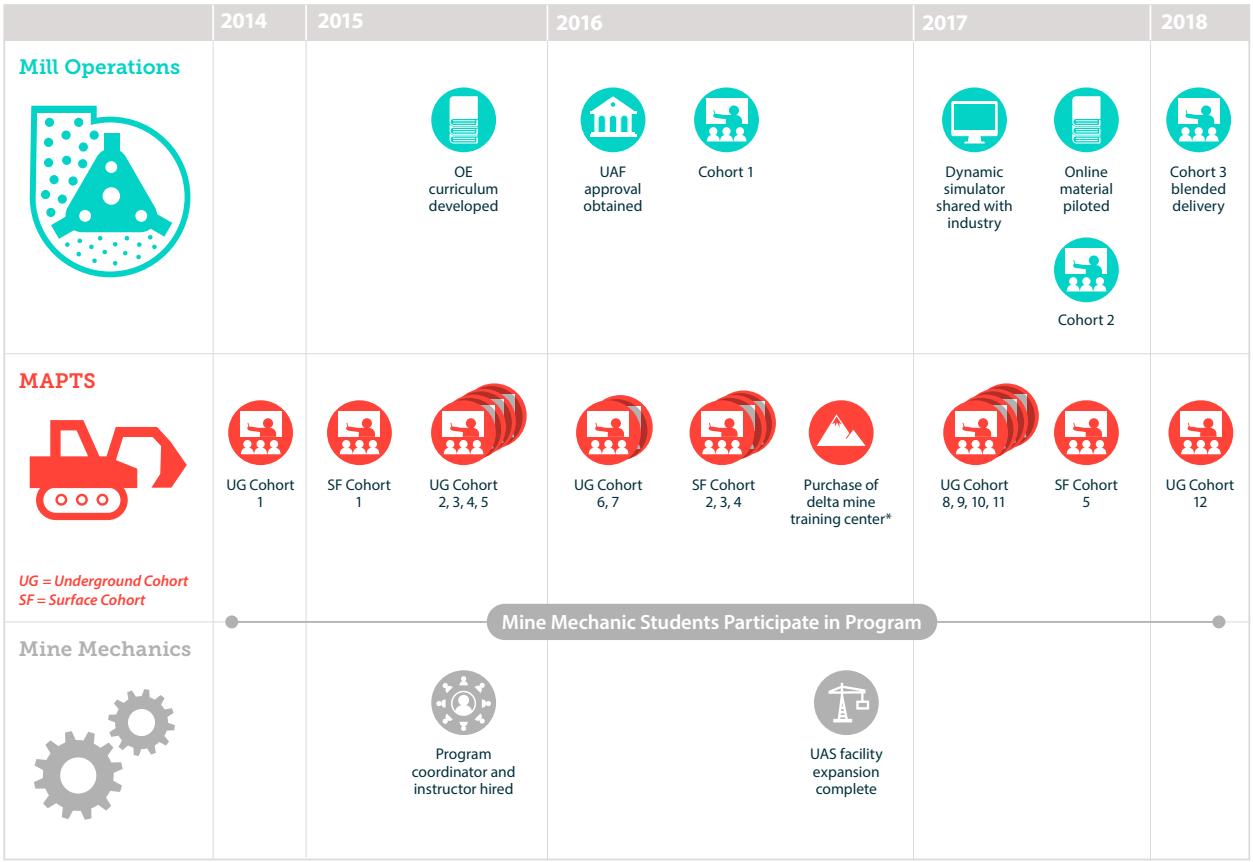
The defining features of the MAPTS programs include hands-on learning in a facility that emulates the work environment at a mining site; employability skills training; holistic academic, nonacademic, and career supports for participants and alumni; successful recruitment of rural and Alaska Native participants; and strong employer and workforce partner engagement. Under the TAACCCT grant, MAPTS offered two training opportunities: underground mining and surface mining. The 280-hour underground mining program is structured to mirror a miner's typical work schedule: two weeks of 10-hour days in the mining camp, two weeks off, and another two weeks of 10-hour days. The surface mining program runs for two weeks and includes 140 hours of instruction. Program completers earn a Mine Safety and Health Administration (MSHA) certificate but do not earn college credit.

Mine Mechanic Programs

The Mine Mechanic programs prepare students to enter the mining industry as entry-level diesel machinery mechanics. Housed at the UAS Center for Mine Training in Juneau, Alaska, the Mine Mechanic programs are part of an extended career pathway that begins with an Introduction to Mining Careers and Occupations course, continues with a two-week "Mine Academy" that results in MSHA certification, and leads to a job-shadow experience at the Hecla Greens Creek Mine for selected students. The pathway offers students the option to apply to a one-year, 29-credit Mine Mechanic OE or a two-year, 61-credit Mine Mechanic AAS degree program. Typically, students apply after completing the introductory components of the pathway, but students are eligible to apply to the OE or AAS degree programs at any time.

The primary goal of the Mine Mechanic programs is to train a local workforce for a high-wage career in the mining industry while also meeting industry needs and strengthening local economies. The program includes classroom and hands-on training on diesel engines and related mechanical systems, including engines, transmissions, brakes, hydraulics, DC electrical systems, suspension, and air conditioning. Maintaining diesel-powered pickups, welding, performing preventive maintenance, and conducting inspections are also covered.

***Figure 2.** University of Alaska Round IV TAACCCT milestones timeline*



*The MAPTS remote camp facility is located at the Delta Mine Training Center, which was purchased by the University of Alaska during the grant.

Source: Authors.

Section 2: Program implementation strategies to prepare Alaska's mining workforce

Education Northwest evaluated the implementation of the UA TAACCCT initiative from spring 2015 to spring 2018. The evaluation aimed to capture how the initiative leaders managed the development and implementation of each program, as well as evidence of the operational capacity of the overall initiative. Five questions guided this work:

1. How were UA TAACCCT programs and curricula designed, improved, or expanded to provide students with the necessary skills to work in the mining industry and pursue further education?
2. To what extent did the UA TAACCCT programs serve target populations, especially adult, TAA-eligible, Alaska Native, veteran, and unemployed workers?
3. What academic, career, job placement, or other supports were provided to program participants?
4. To what extent did the UA TAACCCT programs partner with local industry leaders and workforce groups in developing the curricula, securing resources, and providing supports for job preparation and placement?
5. To what extent were key strategies and activities implemented as planned?

Evaluation activities included collecting a variety of data and conducting multiple in-depth site visits with all programs. To map out the central assumptions regarding how UA's TAACCCT initiative would meet its desired outcomes, evaluators facilitated logic model meetings with program leaders. The evaluation team drafted logic models for each program, revising key elements through a collaborative process with program leaders. The logic models included in appendix A of this report were used to support program learning, modify program strategies, and guide evaluation efforts. Data collected during this evaluation included program documents, interviews, focus groups, observations, and surveys. An overview of the data sources and data collection timeline is provided in table 3.

Table 3. ***Data collection activities by time period***

	Spring 2015	Fall 2015	Spring 2016	Summer 2016	Fall 2016	Spring 2017	Summer 2017	Fall 2017	Spring 2018
Program documents	●	●	●	●	●	●	●	●	●
Logic modeling meetings		●							
Interviews:									
Program leads	●	●	●	●	●	●	●	●	●
Program faculty and staff	●	●	●	●	●	●	●	●	●
Alaska Native organizations									●
Employers		●			●				●
Workforce agencies						●			
University leaders	●	●	●		●	●			
Alumni									●
Student focus groups			●	●	●	●	●	●	●
Classroom observations and facility tours		●	●	●	●	●	●	●	●
Student surveys				●			●		

Source: Authors.

Summative findings from the implementation study are organized by research question below.

Question 1: **How were UA TAACCCT programs and curricula designed, improved or expanded to provide students with the necessary skills to work in the mining industry and pursue further education?**

Through a successful cross-unit collaboration, the UA TAACCCT initiative launched a unique program to meet industry needs. The University of Alaska Fairbanks (UAF) partnered with its Community and Technical College (CTC) and Prince William Sound College (PWSC) to develop a new training program, the Mining Mill Operations OE, that enhanced the two institutions' capacity to address an industry need for workers with a strong understanding of the mill operations process. The OE program is the first to offer a credential in mill process operation in the United States. The team worked together to meld theoretical concepts with occupational skills in building the curriculum, instructional materials, and laboratory activities. They each brought their own set of technologies and equipment into the program and shared teaching and student support activities. In addition, the team accessed UAF e-learning experts, who were able to develop electronically based support materials for various courses and ultimately translated classroom courses into online courses for the third cohort of students. This is a tangible example of university-community college institutional collaboration and capacity building.

Implementing the Mining Mill Operations program's mixed curriculum required a complex management structure. The program has two leads—one from UAF and one from CTC. In addition, the program works with staff at the e-learning department at UAF and e-learning faculty at PWSC to develop online course materials. Distance collaboration was required for PWSC, which is located east of Anchorage in Valdez, Alaska. In addition, although CTC is affiliated with UAF, each campus has different administrative structures and procedures.

Because this partnership came about as a result of the TAACCCT grant, the program leads and staff members needed to develop new collaboration and communication structures and define roles and responsibilities for each member of the team while simultaneously developing program components. Since convening all team members regularly was challenging—and because the instructors at UAF, CTC, and PWSC had very different areas of expertise and experience with students—clear communication and consensus about how to develop and implement the program took time to establish. The consortium principal investigator and project manager supported the Mining Mill Operations team by convening and facilitating meetings and regularly communicating online and in person with each team member to help them develop a common vision for the program and make progress on deliverables.

Each UA TAACCCT program incorporated opportunities for authentic experiential learning. Incorporating experiential, hands-on learning opportunities was one of the core strategies of the UA TAACCCT initiative for preparing students to successfully work in the mining industry. Each program leveraged TAACCCT funds to utilize, develop, or expand resources to support hands-on training.

The MAPTS program used TAACCCT funding to cover costs associated with operating its own underground and surface mines, where both the classroom instruction and experiential learning take place. The remote camp facility includes operational mine sites, state-of-the-art simulators for operating heavy equipment, and several types of heavy and light equipment required for entry-level mining job tasks. Delivering the program in an operational mine enabled students to learn specific hands-on technical skills.

The program curriculum and activities also simulated a real-life mining environment to prepare students for the physical and social experience of working and living in a camp environment on a 24/7 schedule. The site featured living quarters, a cafeteria, and a laundry room that mimic those on mine sites. Students were expected to show up on time and prepared, keep their rooms orderly and their beds made, and to follow strict procedures for personal protective clothing and equipment. Students learned detailed mine site safety procedures for work and leisure time, including using hand sanitizer and disposable gloves when serving themselves food in the cafeteria.

The MAPTS curriculum also provided students with opportunities to practice interpersonal and work-life management skills required to be a successful miner. Instructors designed problems for students to solve in a team. Sometimes these problems were set up without informing students, such as leaving a tool inside the wheel well of a truck, to test students' abilities to identify and solve problems on their own. Instructors conducted role play on different styles of management that students may have to negotiate in the workplace. Each student took turns being a team leader and a safety leader for one day, with responsibilities for documentation, reporting, and management that were similar to those used in the mines. The goal was to develop an understanding of supervisors'

roles so that they can meet expectations and have familiarity with what a managerial job entails if they are able to advance in their careers. Students also learned how to effectively manage home life on the two-week breaks that are typical in mining jobs, including strategies to prioritize quality time with family and taking care of important tasks at home so that they can return to work healthy and focused.

Another example of incorporating hands-on learning is illustrated by the Mining Mill Operations program. The program's laboratory sessions allowed students to work in teams to solve problems and repair equipment that they are likely to encounter in the field. The third cohort of students experienced a two-week camp life experience and schedule inspired by the one offered at MAPTS. Program leads also used TAACCCT funds to develop a dynamic mill process simulator that mimics actual process operations better than any existing technology. A workable version of the simulator was completed in winter 2017 and partially incorporated into classes for the last cohort of students. Ultimately, program leaders hope to develop a version of the simulator that can be used as a primary training tool at mines and in the Mining Mill Operations program.

A significant portion of the Mine Mechanics program's TAACCCT funding was allocated for facility renovations to accommodate additional students and training activities. After the completion of renovations in fall 2016, program leaders reported that the new large classroom and workspace provided more opportunities for hands-on learning with equipment. The center also actively promotes its new facilities and programming by hosting events in the new classroom and laboratory space. For example, the center invited legislators to visit and experience its simulator and hosted meetings for local mining association members.

The UA TAACCCT programs included features to meet the unique needs of students. The UA TAACCCT program leaders made several program design decisions to address the specific needs of adult and TAA-eligible students. First, the Mining Mill Operations and MAPTS programs used condensed, intensive curricula that could be completed in 2 to 10 weeks. Adult learners targeted by the TAACCCT grant are less likely to have the time and money necessary to attend school full time for an extended period of time (Berker & Horn, 2003). Shortened course formats may be more responsive to some adult learners' lives by enabling students to quickly reenter the workforce with skills immediately applicable to working in a mining occupation (Wlodkowski, 2003). In addition, the Mining Mill Operations program was intentionally structured to deliver sufficient courses and credits so that it would meet federal financial aid standards. PELL grants for tuition facilitated enrollment for a third of Mining Mill Operations students.

Second, the Mining Mill Operations program developed both classroom and online learning modules to reach students whose circumstances may not allow them to be attend a 10-week program in Fairbanks over the summer. The first two sessions of Mining Mills Operations program were offered in summer 2016 and summer 2017 in a traditional face-to-face format. Program leads struggled to recruit students from outside the Fairbanks area, noting that recruitment from rural areas and Alaska Native villages was hindered by the summer offering that conflicted with peak hunting, fishing, and gathering season.

Throughout the implementation of the OE, program staff members developed online course content, created an online platform, and video recorded a limited number of lectures. The third

cohort of students (spring 2018) participated in a blended-format offering. Students completed part of the coursework online over 14 weeks and the remainder through a two-week stay in Fairbanks. Many students in the third cohort said they would not have been able to enroll if the program had been offered in a traditional face-to-face format or even if they had to attend live lectures online. The modular design of the courses made it possible to complete coursework while maintaining existing professional and family commitments. Further, the hybrid delivery allowed students from far beyond the Fairbanks area to participate in the program. Half of students in the third cohort (4 of 8) resided outside the Fairbanks metropolitan area.

***Question 2:* To what extent did the UA TAACCCT programs serve target populations, especially adult, TAA-eligible, Alaska Native, veteran, and unemployed workers?**

The UA TAACCCT program leaders worked to create strong relationships with local stakeholders to recruit adult, TAA-eligible, Alaska Native, veteran, and unemployed participants. The strategy program leaders used most often to recruit and enroll TAACCCT students was to build and leverage strong relationships with stakeholders who could refer potential students to the programs. Stakeholders included employers, Alaska Native and community organizations, military bases, and job centers. For example, job center staff members are well-informed about the MAPTS program and provided funding for 22 percent of students. MAPTS enrolled many students from TAACCCT populations through its partnerships with employers and community-based Alaska Native organizations. Employers helped recruit and select individuals for training among their job applicants who lacked prior experience. Alaska Native corporations supported efforts to recruit students and hire them in companies they owned, such as Brice Construction. Other Alaska Native tribal organizations assisted in recruitment by helping to identify candidates, conducting interviews and screening, and eventually providing resources to selected students such as helping them pay for travel to and from the program.

In turn, MAPTS was responsive to requests from Alaska Native corporation shareholders to include specific skills that would support the tribes and local economies. During the grant period, 50 of 93 MAPTS participants were Alaska Native. Alaska Native faculty members supported this intentional recruitment and directly engaged Alaska Native corporations and associated communities. MAPTS also served other TAACCCT populations during the grant. Eighty-four percent of participants indicated they were unemployed at the beginning of the program, and 47 percent were 25 years or older. On the other hand, only three individuals reported being a veteran, and only one participant said they were TAA eligible (table 4).

The Mining Mill Operations lead hired a program manager to increase the visibility of the program and build relationships with stakeholders. During the first year of the grant, the program manager undertook a multifaceted recruitment and outreach effort that started with developing marketing materials to advertise the program's availability, describe the career opportunities and benefits, and provide instructions for enrollment. This included printed materials and a website. Program staff members also sponsored an information booth at the 2016 Alaska Miners Association and Convention to share information with potential students and employers. During this event, the Mining Mill Operations and UAF staff members organized an open house to showcase the new program to potential employers. The program participated in the Alaska Miners Association

Convention again in 2017 and 2018, as well as the Society for Mining, Metallurgy, and Exploration (SME) Annual Conference and Mine Expo in 2016, 2017, and 2018. The program manager also frequently reached out to workforce centers, providing information and giving presentations to job center staff members to encourage referrals.

Finally, the program staff made targeted efforts to reach veterans and Alaska Natives. Direct outreach was conducted at a local military base to recruit individuals that are transitioning out of the military. The program manager attended job fairs at military bases to promote all three programs and gave periodic briefings to soldiers. To spread awareness and recruit Alaska Native students, the program manager and faculty traveled to Alaska Native communities to promote participation in the Mining Mill Operations program. These efforts resulted in recruiting program participants from target populations. Sixty-four percent of Mining Mill Operations students were unemployed at the beginning of the program, 68 percent were 25 years or older, and 29 percent indicated they were veterans (table 4).

Table 4. Characteristics of participants by program

Participant characteristic		MAPTS (n = 93)	Mining Mill Operations[a] (n = 28)	Mine Mechanics (n = 24)
Program	Surface Mining	**34%**		
	Underground Mining	**66%**		
Gender	Male	**84%**	**86%**	**96%**
	Female	**14%**	**14%**	**4%**
Locale	Urban[b]	**38%**	**79%**	**46%**
	Non-urban	**62%**	**18%**	**54%**
Race	Alaska Native	**54%**	**18%**	**9%**
	White	**33%**	**68%**	**91%**
	Other	**4%**	**14%**	**0%**
Other characteristics	Completed any degree before program	**5%**	**0%**	**0%**
	Veteran	**3%**	**29%**	**8%**
	TAA eligible	**1%**	**7%**	**0%**
	Employed at time of enrollment	**16%**	**36%**	**17%**
	Mean Age, in years	**26**	**31**	**21**

[a]Demographic information is missing for one student.

[b]Includes Anchorage, Fairbanks-North Pole, and Juneau metropolitan areas.

Note: Due to missing participant data, sample size may vary by participant characteristic.
MAPTS participant data is current through September 2017
Some percentages may not add up to 100 due to missing data.

Source: Authors' analysis of University of Alaska Fairbanks data.

Successfully serving a target population: Alaska Natives in Mining and Petroleum Training Services programs

Alaska Natives constituted over half of MAPTS participants. Ninety-eight percent of Alaska Natives completed the program and their employment rates improved by 28 percentage points within six months of their completion—from 39 to 67 percent. This employment rate is 18 percentage points higher than the percentage of American Indians and Alaska Natives aged 16 to 64 employed in Alaska overall (49 percent; U.S. Census Bureau, 2017). Evaluators identified five program features that enabled these results and that could be valuable to any program:

1. **Committed and proactive recruitment. MAPTS proposed to serve Alaska Natives and took intentional action to do so.** They directly engaged Native groups to cooperatively market the program, determined criteria and processes for participation, and secured resources to cover program costs. Native leaders noted that the program was structured to benefit their members and trusted that program leaders wanted students to succeed.
2. **Customized and culturally appropriate training.** MAPTS designed its programs so that students could gain the understanding and skills needed to immediately work in a mining job upon graduation. This included curricula and learning activities that addressed mining concepts and safety issues, technical skills and hands-on equipment use, and employability skills associated with working at a mining site and especially working in a diverse, multicultural environment and working in teams.
3. **Simulation of the work environment.** MAPTS operates in a fully functioning mining environment in which heavy and light equipment is used for hands-on learning in underground and surface training sites. The remote site also includes a camp facility with living quarters, a cafeteria, and a laundry room that mimic those on mine sites. Students are expected to learn how to work and live at a mining site. Instructors help students acclimate to life in a camp setting and provide guidance on strengthening interpersonal skills that facilitate productive, collegial relationships on and off the clock.
4. **Comprehensive supports.** MAPTS program leaders recognize that many participants have low basic skills and limited work experience. As such, the program provides academic and nonacademic supports and daily feedback on their progress during the program to help all participants complete the program and have the technical and essential skills for employment at graduation. Supports include individualized academic tutoring, resources to travel to and from home, assistance in maintaining contact with their family and community, and connecting with employers to secure and retain a job.
5. **Strong employer and Alaska Native partnerships.** MAPTS works closely with the mining industry to ensure that the program delivers appropriately skilled workers. MAPTS hires staff with extensive mining experience, and a third of its team is Alaska Native. The program also provides employers with training on hiring and managing a multicultural, local workforce. These efforts lead to employers recruiting and referring participants, providing input into program curricula, donating resources and equipment, and hiring graduates. A strong relationship also exists with Alaska Native corporations who recognize the value of the training program and the commitment to success for all participants. As such, they are willing to interview and employ MAPTS graduates in their companies.

The Mine Mechanic program attempted to create new recruitment strategies geared toward adult learners. To meet the TAACCCT program's goal of increasing access to education and career training for TAA-eligible workers, the Mine Mechanic leads developed new outreach and recruitment strategies geared toward adult learners. First, the program attempted to expand its outreach and communication efforts to increase the visibility of and support for the Center for Mine Training. In 2015, the program staff described making extensive cold calls and visits to different organizations, including the juvenile justice center, job centers, veterans' groups, the State Emergency Response Commission, and the Tlingit and Haida Native organizations. The program staff also reached out to members of the Alaska State Legislature to ask for their support. Finally, the center used flyers and radio and newspaper ads to publicize career opportunities in the mining industry.

Second, the program began to focus recruitment efforts for the Introduction to Mining Careers and Occupations course on adult learners from TAACCCT populations. Prior to receiving the TAACCCT award, the Mine Mechanic program primarily relied on high schools as a pipeline for new participants. The program offered the course to high school students interested in exploring a career in the mining industry. After the course, program leads offered students who showed strong interest and potential in mining a two-week summer internship at the Hecla Greens Creek Mine. Finally, the program invited promising candidates to apply to the one-year, 29-credit Mine Mechanic OE or a two-year, 61-credit Mine Mechanic AAS degree program.

To recruit adults, the program staff attended career and college fairs, including some that were community-based and connected to Alaska Native communities. The program offered its first Introduction to Mining Careers and Occupations course open to adult learners in 2016, with adults comprising approximately 20 percent of participants in the class. Students reported hearing about the course from several different sources: the Tlingit County Central Council (a flyer), online research for the diesel technology OE program, the Tlingit Second Chance program, and the Juneau Job Center.

By 2017, the Mine Mechanic program stopped recruiting adults for the Introduction to Mining Careers and Occupations course when program leads learned that enrolled students did not qualify as TAACCCT participants since the course was considered an elective and did not fulfill a specific OE or AAS degree requirement. Moreover, staff members said they learned adults were not interested in a semester-long course designed to prepare high school students for college and were eager to get back into the workforce quickly rather than continue their education to earn a one- or two-year degree. Program leads also reported challenges in recruiting adult students for the OE and AAS degree programs from distant, rural areas since these programs require students to live in Juneau, which is only accessible by plane or ferry.

By the end of the grant period, staff members reported talking to employers about how to create shorter course sequences that may be more accessible and work better for adult learners. Program leaders have not decided whether adult learners will have access to the industry exposure, internships, and scholarships the Hecla Greens Creek Pathway to Mining Careers provides, or whether they will be limited to applying directly to the OE or AAS programs.

The MAPTS and Mining Mill Operations programs successfully recruited students from TAACCCT populations. Most participants (84 percent) were male, more than half were Alaska Native (54 percent) and about two-thirds (62 percent) lived outside of Alaska's urban areas (see table 4). The average age of participants was 26 years. Few participants were employed at the time they matriculated in the program. In comparison, among all noncredit, undergraduate, and graduate students attending the University of Alaska Fairbanks campuses, 41 percent were male, 21 percent were Alaska Native, and the average age was 26 (University of Alaska Fairbanks, 2018).

The Mining Mill Operations Program was successful at recruiting older adults and veterans. Among the 28 participants of the mill operator program, a little over a quarter (29 percent) indicated they were veterans, and the average age of participants was 31. Furthermore, most participants were males (86 percent), identified as white (68 percent), and lived in an urban area (79 percent).

Question 3: What academic, career, job placement, or other supports were provided to program participants?

Each UA TAACCCT initiative program provided academic supports to participants, although the approach they used and the consistency of the supports they provided varied both within and across programs. Each program took a different approach to providing academic supports to TAACCCT students. Mining Mill Operations and MAPTS program faculty and staff members personally delivered all student supports, while the Mine Mechanics program coordinator facilitated connections between students and general university resources. The Mining Mill Operations program anticipated that the integration of university theory course material with hands-on-skills training might present academic challenges to students, especially those without strong math skills. To address students' academic needs, the program assigned faculty and staff members with specialized content knowledge to serve as tutors for participants rather than expecting students to access the general college tutoring services. Students in focus group sessions indicated their appreciation for the academic support provided during the first two training cohorts and expressed the importance of having tutors who were directly available to them and had subject matter expertise. The high rate of completions for those two sessions (97 percent) suggests the possible benefit of such actions. This level of dedicated tutoring was not available to the third cohort of students who completed coursework in online modules. These students indicated that academic assistance was needed and would have been valued.

The MAPTS program used data collected, analyzed, and discussed daily among all faculty and staff members to customize the academic supports provided to participants. Specifically, students filled out time cards to track the number of minutes spent on each activity (for example, classroom, simulator, equipment, and safety modules), capturing how much exposure students had to a given skill. These data were entered into a spreadsheet nightly. Instructors met as a team in the early morning to discuss student progress, using the data to determine whether students who had not mastered a skill had had sufficient time to practice it. Next, they used this information to provide interventions to students who were struggling, such as one-on-one guided practice.

The Mine Mechanic program hired a student coordinator in November 2015 to help with academic and financial advising and connect students to university resources. Although program leaders had originally intended to have the coordinator spend significant time advising students, she did

so on a limited basis, with faculty members providing most of the student advising and referrals for academic support to the main UAS campus. The coordinator primarily served as a point of contact for students, especially during registration and graduation. She also played a pivotal role in facilitating student-instructor meetings.

None of the programs offered program-specific remediation or other academic supports for prospective students who did not meet admissions requirements, and only the Mine Mechanic programs required students to pass general math and English courses to obtain the OE or AAS. The Mining Mill Operations and MAPTS programs did not require remediation but rather built tutoring and academic counseling into the program to support students with low basic skills. The programs also concentrated on recruitment efforts for students who already met minimum admissions requirements, which primarily consisted of having a high school diploma. While MAPTS did not administer any sort of admissions testing, the Mining Mill Operations program used placement test scores to inform instructors on how to support each student's learning.

The MAPTS program provided extensive, culturally responsive support for developing industry-relevant interpersonal skills. The MAPTS program has a unique emphasis on supporting students to develop the work-ready and personal skills, habits, and social abilities that entry-level miners need to maintain employment and advance in the industry. This instruction is tailored to the TAACCCT students they recruit, who are typically from remote rural villages and often lack formal work experience and postsecondary education. In addition, the majority of students are Alaska Native, and many have never worked or lived in a diverse cultural environment before. In a camp facility designed to mirror all aspects of life at a mining site, instructors blend Native and western ways of communication and learning to help students learn basic life skills, work-life management skills, and interpersonal communication skills.

A diverse team of instructors (a third of whom are Alaska Native) demonstrate and provide direct instruction on working in multicultural teams and use culturally appropriate instructional strategies that relate job skills to students' experiences (for example, the careful preparation that goes into operating dangerous equipment is akin to that which is required for a moose hunt). Students learn about the benefits of teamwork, what makes a good teammate, and how to work in a multicultural workplace. This includes instruction on how to address people, ask and respond to questions, and give opinions in Native and western cultures. Throughout the course, instructors then observe and evaluate students' strengths and areas for improvement—as team members and as individuals—both on technical skills and work-ready skills such as communication and teamwork. Instructors provide daily feedback, and students also have an exit interview with the program lead before graduating. The program lead provides feedback on the students' strengths, progress on emerging skills, and areas for improvement after they are employed. Students understand from the beginning of the course that the same information will be shared with employers upon request.

The program also teaches strategies for how to manage life while working away from home on shifts, including how to spend quality family time on their days off and how to anticipate and address problems before going back to work. Students learn about how to manage personal challenges that can otherwise prevent them from holding and retaining a job. Correspondingly, students often report that this curriculum positively impacted their lives.

UA TAACCCT programs provided career supports to help students transition from education and training to employment. Each UA program provided supports for job placement and career development to students. For example, the Mining Mill Operations program provided guidance on resume writing and held practice interview sessions with students. All cohorts visited two working mines to better understand the day-to-day work conditions and speak with mill operators and their supervisors. For each session's graduation ceremony, staff members organized job interviews with representatives from four to five major mining employers in Alaska. Students found these introductions very helpful. "It is phenomenal that we have a chance to talk to multiple mine companies and meet at this mining conference where there are other mine companies that are not interviewing," one graduate commented. "It is a great start to our future."

Similarly, the MAPTS program held interview practice sessions and provided a class on writing resumes to help students recognize and report their skills and experience, even if they had no formal work experience. MAPTS provided students with connections to employers for interviews, and employers reached out to instructors for referrals when they were recruiting. Some students reported that employers referred them to the MAPTS program and had offered an interview or a conditional job offer upon completion of the program. After graduation, MAPTS instructors and the student coordinator provided ongoing support for finding a job, including one-on-one coaching for alumni before phone and in-person interviews, as well as debrief calls to discuss what went well and how to improve for future interviews. One program alum described receiving constructive feedback from multiple program staff members after a poor performance during a job interview. She added that the feedback "helped steer me in the direction I needed to go. I did well on my next phone interview with Greens Creek, then got an on-site interview and a job."

The MAPTS program also counseled alumni on how to adjust to the workplace and advance in their careers. A strong alumni network supports the work of MAPTS faculty and staff members to provide career guidance after students complete the program. MAPTS provides students with stickers that can be worn on their hard hats so that other alumni can easily be recognized, and they maintain an active presence on Facebook, providing a venue for alumni to connect with MAPTS faculty and other graduates. Finally, MAPTS staff members also work with employer partners and their frontline supervisors to prepare them for bringing Alaska Natives into their workforce; a key focus was helping them see how worker recruitment and retention could be strengthened by having a better understanding and appreciation of the cultural norms of these prospective employees.

The Mine Mechanic programs introduced students to guest speakers from mining companies and took students on field trips to operating mines. The student coordinator and program leaders observed that many program participants needed to develop job search skills in areas such as creating resumes, using LinkedIn, preparing for interviews, and writing cover letters. While there was some discussion about offering a summer workshop that would cover these topics, these ideas were not implemented. Instead, students were referred to the main campus. The program did, however, offer employment readiness and transition support by setting up internships and job interviews with the Coeur Kensington and Hecla Greens Creek mines. The student coordinator also connected students with alumni at special events.

Question 4: **To what extent did the UA TAACCCT programs and partner with local industry leaders and workforce groups in developing the curricula, securing resources, providing supports for job preparation and placement?**

All three UA TAACCCT programs relied on employer input to develop curriculum and instruction that were responsive to industry needs. The UA TAACCCT initiative leaders engaged employers in the initial design of their program's curriculum and continued to gather feedback during program implementation. For example, the UAF/CTC team utilized exiting connections with local mining companies to gather input on the structure and curriculum of the Mining Mills Operations program. It also engaged industry representatives in instructional activities, such as field trips to mines that helped students learn about mining work and mill process operations. Finally, three Alaska employers tested a software-based simulation training tool designed for students and provided feedback on how effectively it captured the realities of mill process operations.

The MAPTS leaders curated a strong relationship with mining companies in Alaska, tapping employers for input on the design of its program. Program faculty members continue to meet regularly with employers to make curriculum refinements and keep instruction aligned with new procedures or mining equipment. The program also worked closely with employers to learn how each one approaches safety, equipment inspection and operations, and environmental protections. Instructors differentiated instruction for students so that they are not only familiar with the basics of mining, but also with the unique procedures they will be asked to follow at specific mines. Finally, employers donated equipment to support the hands-on learning approach emphasized in the program. For example, a partnership with Brice Construction, an Alaska Native–owned company, led to a donation of heavy equipment valued at $500,000.

The Mine Mechanics program leaders consulted with an industry advisory committee to develop new course content. When employers said that they needed skilled welders, the program began developing a new welding OE. The new program will be a consolidation of various welding programs and will be offered at all three campuses, allowing students to obtain a national certification in welding. The curriculum was written and submitted for review to the curriculum committee in 2018, and at the time of this writing it is in the approval process.

UA TAACCCT program leaders developed three partnerships that contributed to student recruitment. The UA TAACCCT program leaders actively engaged local industry and stakeholders to boost program recruitment. Three partnerships made noteworthy contributions to this end. First, MAPTS's relationship with local employers provided significant support to recruiting TAACCCT participants. Employers assisted in marketing program materials in their local communities and identified interested participants in their workforce and applicant pools. They conducted interviews and drug testing for those who seemed liked strong program candidates. After a student was accepted to the program, employers, in some instances, provided modest resources to MAPTS to help cover some costs of program participation, such as travel expenses to the training facility. Finally, some students entered MAPTS with an employer providing a conditional offer of employment or an interview upon successful program completion and an endorsement by the MAPTS staff.

Second, MAPTS leaders developed an extensive relationship with Tanana Chiefs Conference (TCC) to increase Alaska Native participation in the program. TCC is a tribal consortium of the 42 villages in the interior of Alaska and operates as a nonprofit organization that works toward meeting the needs and challenges for more than 10,000 Alaska Natives, including addressing workforce training and employment needs. TCC established a strong partnership with MAPTS during the grant, seeing the opportunity to get members into a training program that was crafted with both a desire to work with tribal groups and a strong understanding of what is important to facilitate participant learning, program success, and access to employment. TCC noted that an important characteristic of the MAPTS program is its overt commitment to student success. TCC played an active role in recruiting and selecting participants for the program and assisted prospective students in filling out the program application, developing a resume, preparing for an interview, and securing the endorsement of their tribal leaders. In addition, TCC provided resources to support participation in MAPTS training, such as covering costs for transportation and work gear for the program. Overall, TCC sent approximately 20 students to the underground and surface mining programs between 2017 and 2018 and hopes the program will continue to be available in the future.

Finally, the Mining Mill Operations program seized an opportunity to recruit veterans. The combination of several local bases in proximity to Fairbanks and the hiring of a TAACCCT grant manager with a military connection resulted in direct outreach to the bases. At the bases, the program manager participated in job fairs and communicated directly with interested students. These efforts led to the successful enrollment of veterans in each of the three cohorts of training. For the entire grant period, 29 percent of all Mining Mill Operations participants were veterans. The program also worked with the Alaska Native NANA Regional Corporation, which operates the Red Dog Mine. One student, a NANA shareholder, completed the program and was subsequently hired as a mill operator at Red Dog Mine.

Question 5: To what extent were key milestones and deliverables implemented as planned?

The majority of UA TAACCCT initiative strategies and activities were implemented as planned. The UA TAACCCT technical narrative identified several milestones that the initiative would accomplish over the course of the grant period. Most deliverables were met with no or minor modifications (see table 5 for an overview by program). One change worth noting concerns building renovations for the Mine Mechanics program. A significant portion of the Mine Mechanics program's TAACCCT funding was allocated for the purchase and installation of a bridge crane and facility renovations that would accommodate additional students and training activities. Initial assessments by contractors, however, revealed that there was not enough space to house a bridge crane, leaving $90,000 of the mine mechanics TAACCCT funding unallocated. In addition, cost estimates for the other building renovations were 20 percent higher than anticipated. Program leaders explored whether the funds no longer being used for the bridge crane could be used to cover the additional costs of building renovations. While waiting for a response from the U. S. Department of Labor, the UAS chancellor approved additional university funds to be used for the renovations. Program leaders received approval from the U.S. Department of Labor to reallocate the funds from the bridge crane to the facilities expansion in April 2016 and completed renovations in fall 2016.

Table 5. ***Progress on UA TAACCCT initiative milestones***

Program	Proposed deliverables	Status
Mining Mill Operations	• Occupational Endorsement Approval • Offer program twice • Two industry demonstrations of simulator • Use simulator in two program offerings • 10 program completers, 2016 • 20 program completers, 2017 • Survey employers, 2018	• Approval obtained, 2016 • 2 in-person program offerings, 2016 and 2017 • 1 blended online program offering, 2018 • 1 industry simulator demonstration, 2017 • Trial use of simulator in program, 2018 • 9 program completers, 2016 • 10 program completers, 2017 • 8 program completers, 2018 • No formal employer surveys, but regular collaboration to gather input on program and curriculum design and dynamic mill process simulator tool
MAPTS	• Offer training 6 times per year • 30 completers over 6 offerings, 2015 • 30 completers over 6 offerings, 2016 • Survey employers, 2016 & 2017	• Program offered 5 times per year • 5 program completers, 2014 • 29 program completers, 2015 • 29 program completers, 2016 • 27 program completers, 2017 • 11 program completers in 2018 • No formal employer surveys, but regular communication with hiring managers and mine supervisors
Mine Mechanics	• Hire program instructor • Hire program coordinator • Complete building upgrade • Purchase bridge crane	• Hired instructor in 2015, instructor resigned in 2016 • Hired adjunct instructor in 2017 • Hired student coordinator in 2015, coordinator resigned in 2017 • Hired new student coordinator in 2018 • Building renovations completed in 2016 • Did not purchase bridge crane
Consortium	• Create website • Presentation at Society for Mining, Metallurgy & Exploration (SME) Annual Conference and Mine Expo • Presentation at mining trade conference	• Website launched, 2015 • Annual recruitment trips throughout Alaska • Recruitment trip to the lower 48 in 2017 • Presented at SME, 2016, 2017, and 2018 • Presented at mining trade conference each year from 2015 through 2018

Source: Authors.

Section 3: Participation, education, and employment outcomes for Mining and Petroleum Training Services students

The outcomes study for the UA TAACCCT initiative focused exclusively on the MAPTS program. The Mining Mill Operations and Mine Mechanics programs each had fewer than 20 completers by March 2017—a sample size that was too small to draw meaningful conclusions. Outcomes for MAPTS Surface and Underground Mining programs were evaluated separately, due to the different lengths of instructional time (140 and 280 hours, respectively), the seasonal nature of surface mining and construction jobs compared to year-round underground mining jobs, and differences in the demographic composition of each program's students (table 6). In addition, only students who completed the program by September 2017 were included in the analytic sample to allow sufficient time to observe post-program outcomes.

Outcomes evaluation questions

Three sets of questions guided the outcomes evaluation:

1. **Program participation:** How many participants did MAPTS serve and how many completed their program?
2. **Educational attainment:** How many MAPTS participants continued their education after they completed the program, earned credits, or completed degrees?
3. **Employment outcomes:** How many MAPTS participants obtained employment after participating in the program? How do the wages and job retention rates of MAPTS participants compare to those of similar individuals who enter mining and related industries without MAPTS training?

The remainder of this section presents a brief description of the data and methods used to address the evaluation questions, followed by a summary of program participation, educational attainment, and employment outcomes for Surface Mining and Underground Mining participants. Appendix B provides detailed information about the study's sample, data, analytic methods, and results.

Data and methods

The evaluation team employed two analytic strategies to assess MAPTS participants' education and employment outcomes and generate early evidence of the programs' impact on wages and job retention. First, descriptive statistics were used to evaluate outcomes such as how many continued their education after the program, how many were employed after completing the program, and the average wages of students who obtained employment. Wage analysis was conducted for individuals who had wage records prior to entering the program (incumbent workers). Second, evaluators examined the effect of MAPTS on participants' wages and job retention using a quasi-experimental method called coarsened exact matching to compare results for participants to those of a matched comparison group with similar background characteristics.

The study used UAF administrative data for the 1999–2000 through 2017–18 school years, as well as records from the Alaska Department of Labor and Workforce Development (DOLWD) from September 2010 through March 2018. Data from UAF included records from the entire University of

Alaska system of two- and four-year colleges, while the DOLWD data included records from all Alaska residents. Fifty-eight Underground Mining and 31 Surface Mining programs were found in DOLWD records.

Given reporting lags, employment outcomes four quarters after program completion were not observed for 13 (21 percent) of the Underground Mining participants and 10 (31 percent) of the Surface Mining participants who completed the MAPTS program after March 2017. Education outcomes through spring semester 2018 and employment outcomes up to two quarters after program completion were available for all cohorts. Because almost a third of the already small Surface Mining program sample is excluded, results for this program in the four quarters after participation should be interpreted with caution and verified in the future when additional data become available.

Program participation: How many participants did MAPTS serve and how many completed their program?

The Surface Mining and Underground Mining programs served different demographic populations. During the TAACCCT grant, 93 individuals participated in the MAPTS program through September 2017. Of these, 61 participated in the Underground Mining program (66 percent) and 32 participated in the Surface Mining program (34 percent) (see table 6). Differences in the composition of MAPTS participants existed between the two programs. Most Surface Mining program participants were Alaska Native compared to 39 percent of Underground Mining participants. A higher percentage of Surface Mining participants (88 percent) lived outside Alaska's urban areas compared to the Underground Mining participants (49 percent). Furthermore, the mean age for Surface Mining participants was five years lower than that of Underground Mining participants.

Table 6. Composition of program participants by MAPTS program type

Participant characteristic		Surface Mining (N = 32)	Underground Mining (N = 61)	Statistically significant difference in means
Gender (%)	Male	**81**	**88**	
	Female	**19**	**12**	
Locale (%)	Urban[b]	**13**	**51**	***
	Non-urban	**88**	**49**	***
Race (%)	Alaska Native	**88**	**36**	***
	White	**0**	**51**	***
	Hispanic/Latino	**0**	**2**	
	Asian	**0**	**2**	
	Pacific Islander	**0**	**2**	
	Other	**0**	**2**	
Other characteristics	Mean age	**23**	**28**	*
	Earned any degree before program (%)	**0**	**8**	
	Veteran (%)	**0**	**8**	
	TAA eligible (%)	**4**	**0**	
	Employed at beginning of program (%)	**13**	**19**	

* $p < 0.05$, *** $p < 0.001$

Note: Some percentages may not add up to 100 due to missing data.

Source: Authors' analysis of University of Alaska Fairbanks data.

Most MAPTS participants successfully completed the program. Of the 93 participants, 90 completed the program, for a completion rate of 97 percent. All Surface Mining participants completed their two-week program, while 58 of the 61 (95 percent) Underground Mining participants completed their six-week program.

Educational attainment: How many MAPTS participants continued their education after they completed the program, earned credits, or completed degrees?

Few participants continued their education after completing a MAPTS program. Aside from earning a Mine Safety and Health Administration certificate, the MAPTS program does not award credit hours or any type of postsecondary degree. Consequently, no MAPTS participant earned credits through MAPTS. This is a viable model since the goal of the short, intensive training programs is to transition participants directly into an entry-level mining extraction job that does not require a postsecondary credential. Not awarding a formal degree or certificate enables MAPTS to serve individuals with low basic skills while bypassing the need for admissions tests and academic remediation.

Only three participants enrolled in further education and earned postsecondary credits after MAPTS. All these participants were in the Underground Mining program and all had earned a postsecondary degree prior to participation in MAPTS. Furthermore, two MAPTS participants participated in other TAACCCT programs. One participant was enrolled in the Mine Mechanics OE program at UAS before attending MAPTS, and a second individual participated in the Surface Mining program after completing the Underground Mining program. Table 7 summarizes educational outcomes of MAPTS participants.

Table 7. Educational outcomes for MAPTS participants

Educational outcome	Number
Completed credit hours after MAPTS	**3**
Enrolled in further education after MAPTS	**3**
Participated in other TAACCCT programs	**2**
Earned credentials before or after MAPTS	**5**
Total participants	**93**

Source: Authors' analysis of University of Alaska data.

Employment outcomes: How many MAPTS participants obtained employment after participating in the program? How do the wages and job retention rates of MAPTS participants compare to those of similar individuals who enter mining and related industries without MAPTS training?

Most MAPTS participants found employment after participating in the program. Eighty-three percent of MAPTS participants (77 of 93) obtained employment in Alaska within two quarters of

participating in the program (table 8). This excludes students who may have found employment outside Alaska or who worked in Alaska for the federal government, as an independent contractor, or in fish harvesting—positions that do not report wage and employment data to DOLWD. Compared to the two quarters prior to their participation, this represents a 37 percentage-point growth in employment for Surface Mining participants and an 8 percentage-point growth in employment for Underground Mining participants. Among participants whose outcomes are observed, 84 percent of Surface Mining participants and 87 percent of Underground Mining participants found employment in Alaska within the first four quarters after participation. In addition, 40 percent of these Surface Mining participants and 71 percent of these Underground Mining participants obtained employment during the first quarter after participating in the program and remained employed in all four quarters after participating in the program.

Table 8. Cumulative percentage of program participants employed in Alaska

	Percentage of participants employed in Alaska			
Program	**During any of the four quarters prior to participation**	**During either of the two quarters prior to participation**	**Within first two quarters after participation**	**Within first four quarters after participation**
Surface Mining cohorts 1–5 (n = 32)	**72**	**47**	**84**	**82**[a]
Underground Mining cohorts 1–10 (n = 61)	**79**	**74**	**82**	**88**[b]
Both programs (n = 93)	**76**	**65**	**83**	**86**[c]

[a]Excludes 10 students from cohort 5 whose outcomes were not available due to lags in data collection.
[b]Excludes 13 students from cohorts 9 and 10 whose outcomes were not available due to lags in data collection.
[c]Excludes 10 Surface Mining and 13 Underground Mining students whose outcomes were not available due to lags in data collection.

Note: Excludes military and civilian federal employees, independent contractors, fish harvesting employees, and workers outside Alaska.

Source: Authors' analysis of Alaska Department of Labor and Workforce Development data.

By the first quarter of 2018, 44 percent of MAPTS participants had worked in mining after completing their program (table 9). An additional 24 percent of participants, primarily from the Surface Mining program, applied the skills they acquired in the construction industry. Of Surface Mining participants, 3 (11 percent) had worked in mining and 13 (41 percent) had worked in construction through the first quarter of 2018. Among Underground Mining participants, 38 (62 percent) had worked in mining and 9 (15 percent) had worked in construction by the first quarter of 2018.

Table 9. ***Percentage of MAPTS participants employed in target industries***

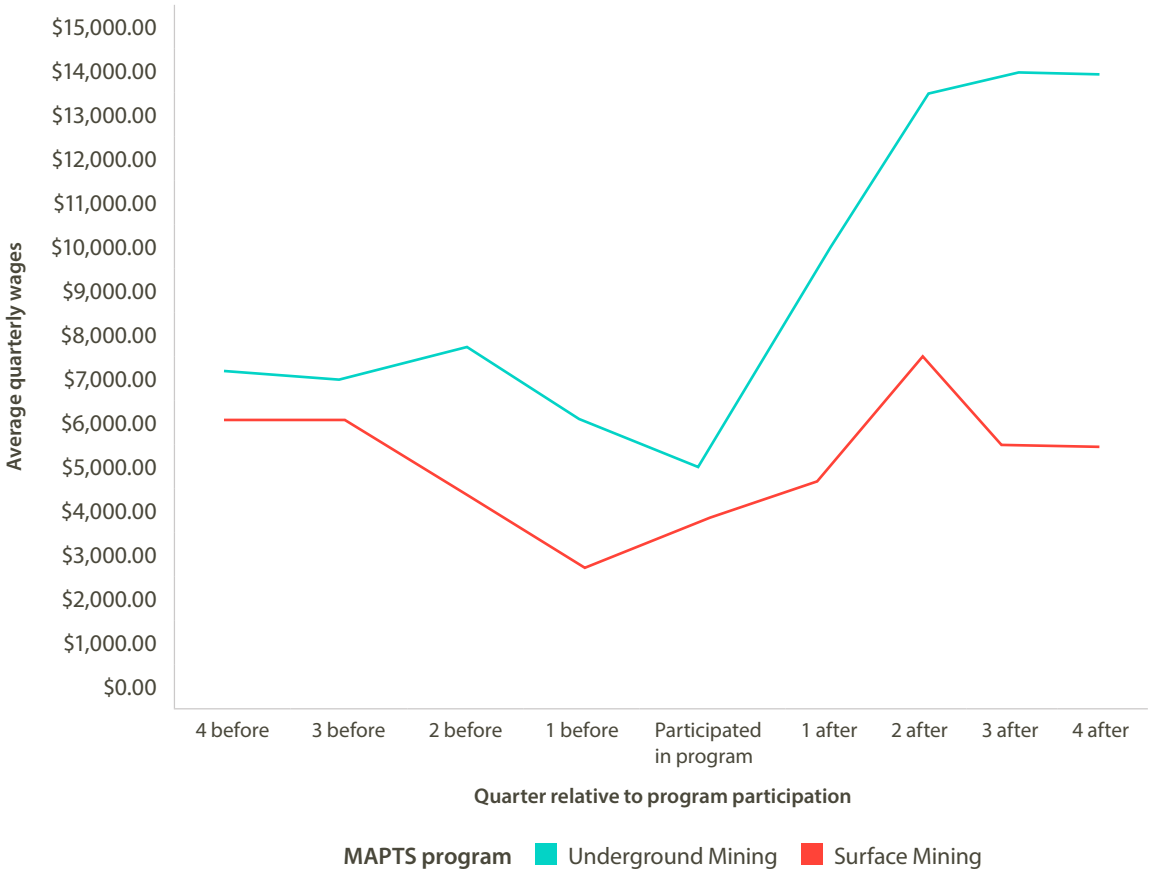
		Percentage of students who obtained employment in Alaskan mining or construction industries after program completion	
Program	**Industry**	**One quarter after program completion**	**Through the first quarter of 2018**
Surface Mining (n = 32)	Construction or mining[a]	**31**	**50**
	Construction	**25**	**41**
	Mining	**6**	**9**
Underground Mining (n = 61)	Construction or mining[a]	**61**	**67**
	Construction	**7**	**15**
	Mining	**54**	**62**
Both programs (n = 93)	Construction or mining[a]	**51**	**61**
	Construction	**13**	**24**
	Mining	**38**	**44**

[a]Includes individuals who worked in either or both the construction and mining industries. The percentage does not equal the sum of the percentage of participants who worked in the construction industry and the percentage of participants who worked in the mining industry.

Source: Authors' analysis of Alaska Department of Labor and Workforce Development data.

Initial wage gains after program completion were large and statistically significantly higher than those of a matched comparison group. Underground Mining participants nearly doubled their average quarterly wages within two quarters of completing the program (figure 3). In the four quarters prior to their program participation, Underground Mining participants earned an average of $6,933 per quarter. In the four quarters after their program participation, they earned an average of $12,480. Surface Mining participants reversed a downward trend in their wages earned between three quarters and one quarter before their participation. During the four quarters after participating in MAPTS, their average quarterly wages were $5,429, compared to an average quarterly wage of $4,315 in the four quarters prior to their participation.

Figure 3. ***Average quarterly wages of MAPTS Surface Mining and Underground Mining participants, relative to the quarter in which they participated in the program***



Note: Sample includes 58 Underground Mining participants in 10 cohorts and 31 Surface Mining participants in 5 cohorts. Due to data collection lags, the sample for four quarters after program participation is limited to 45 Underground Mining participants in 8 cohorts and 21 Surface Mining participants in 4 cohorts.

Source: Authors' analysis of Alaska Department of Labor and Workforce Development data.

Initial wage gains for Underground Mining participants were large and statistically significant and increased over time. Two quarters after program participation, Underground Mining participants earned average quarterly wages that were $6,026 higher than a matched comparison group that entered mining, construction, or another natural resource extraction industry at the same time. The gap in average quarterly wages between program participants and the matched comparison group grew to $7,630 by the fourth quarter after program participation. If this difference in wages were maintained over a year, participants' annual wages would be $30,520 higher than those of the matched comparison group.

Surface Mining participants earned an average quarterly wage that was $2,274 higher than those of a matched comparison group. This difference decreased to $1,844 when measured four quarters after participation and it was only marginally statistically significant with a p-value of 0.068. This may be related to the seasonal nature of surface mining and construction work, as a limited number of activities occur in the winter. Since two full years of data were not available for any of the cohorts,

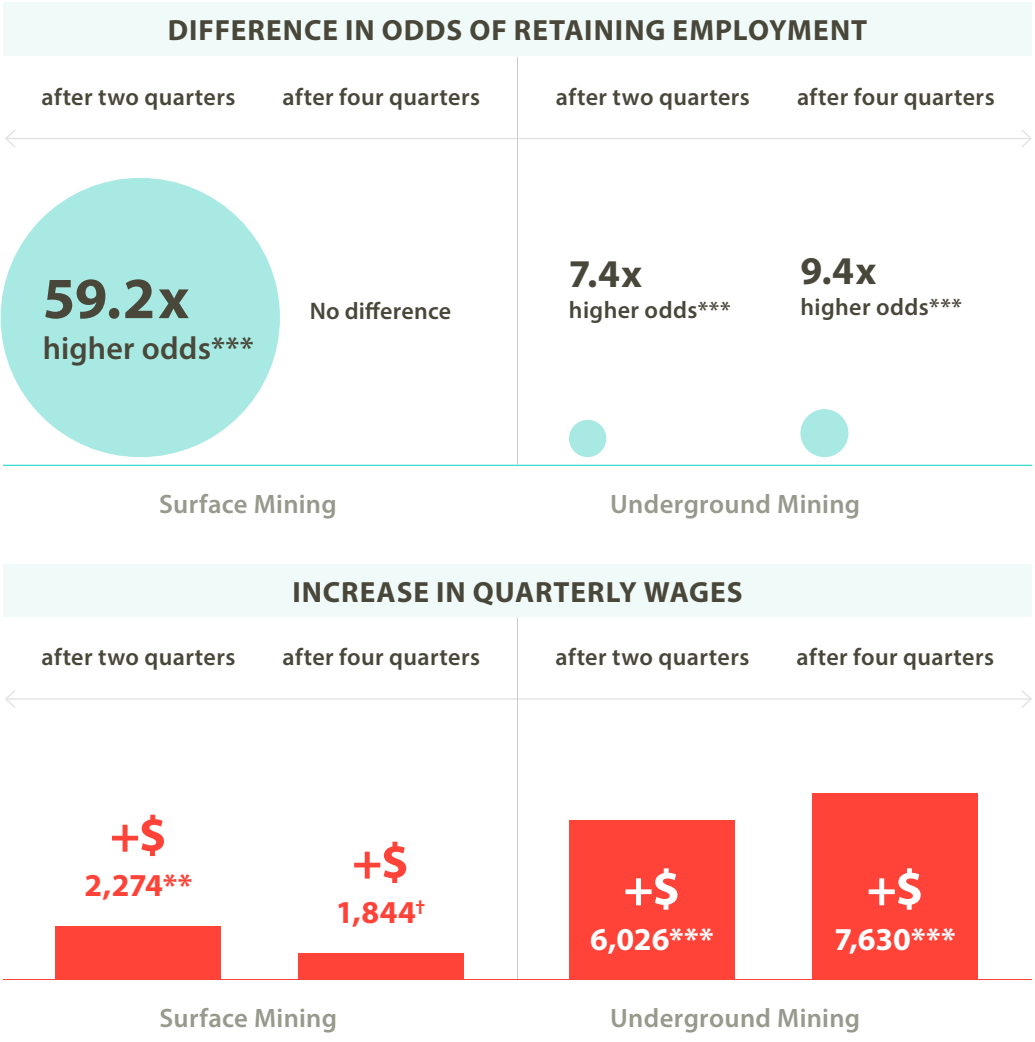
future analysis must determine whether program completers obtained seasonal work in the second year after the program and assess how participants' wages and job retention compared to their matched peers.

The differences in quarterly wages for MAPTS participants relative to a matched comparison group are substantially higher than those found in similar studies of workforce programs. The impact of Workforce Investment Act (WIA) programs for adult and dislocated workers in one study ranged from $300–$450 per quarter (around $330–$500 adjusted for inflation; Andersson, Holzer, Lane, Rosenblum, & Smith, 2013). An earlier matching study found marginal benefits of WIA programs for adults (around $400, or $475 in inflation-adjusted earnings each quarter), but only for three years after program entry (Heinrich, Mueser, Troske, Jeon, & Kahvecioglu, 2009). Finally, a national study of WIA services found that adults earned, on average, $743 more per quarter ($1,109 adjusted for inflation; Hollenbeck, Schroeder, King, & Huang, 2005). Further, the MAPTS results occurred during one of the worst economic recessions in Alaska history and coincided with sharp declines in mineral prices and construction projects that slowed hiring in the industries targeted by its training programs (Schultz, 2017; Zak, 2017).

MAPTS program participants were more likely to retain employment than a matched comparison sample after two quarters, but results varied by program after four quarters. Forty-nine percent of MAPTS Underground Mining participants found a job in the first quarter after they completed the program and were continuously employed for four quarters after program participation. The odds that MAPTS Underground Mining participants would remain employed for two consecutive quarters were 7.4 times larger than the odds that a matched comparison group would retain employment for two consecutive quarters. This difference increased over time (figure 4). The odds that MAPTS Underground Mining participants would remain employed for four consecutive quarters were 9.3 times larger than the odds that a matched comparison group would retain employment for four consecutive quarters.

Twenty-two percent of Surface Mining participants found a job in the first quarter after the program and were continuously employed for four quarters after program participation. The odds that MAPTS Surface Mining participants would remain employed for two consecutive quarters were 59.2 times larger than the odds that a matched comparison group would retain employment for two consecutive quarters. However, the odds of job retention of participants relative to their matched peers after four quarters were not statistically significantly different.

***Figure 4.** Difference in wages and employment retention for MAPTS participants relative to a matched comparison group*



† p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001.

Note: Excludes military and civilian federal employees, independent contractors, fish harvesting employees, and workers outside Alaska. Sample includes 58 Underground Mining participants in 10 cohorts and 31 Surface Mining participants in 5 cohorts. Due to data collection lags, four quarters after program participation this sample is limited to 45 Underground Mining participants in 8 cohorts and 21 Surface Mining participants in 4 cohorts.

Source: Authors' analysis of Alaska Department of Labor and Workforce Development data.

Limitations. The above results suggest the MAPTS program could have positive effects on employment retention and wages. These conclusions are constrained by two primary limitations. First, the study's sample size is small. It contains between 21 and 58 students in the treatment group with observable outcome measures for each analysis. As enrollment increases over time, the validity of these results should be confirmed with larger sample sizes. Second, evaluators selected a comparison group based on the most logical counterfactual—entering the natural resources or construction workforce without any training—rather than the counterfactual of enrolling in a different college or career training program, none of which are similar to MAPTS. Data for this study's comparison group are drawn from workforce records, not education records.

As such, they do not include indicators for race/ethnicity and education level among comparison group subjects. Because both factors may be linked with employment outcomes, and because MAPTS participants are more diverse and have lower levels of education than Alaska adults overall, estimates of the programs' effects could be underestimated if students of color with lower levels of education were matched with White Alaskans with higher levels of education. Appendix B discusses these limitations in more detail.

Section 4: Considerations: promising practices and areas for future research

The three UA TAACCCT programs had several common objectives. Among them, all programs focused efforts on entry-level mining jobs, worked to deliver short-term training, and aimed to serve Alaska residents with emphasis on Alaska Natives and other special populations such as veterans. Program features and implementation activities varied in their approaches to achieving these objectives. Looking across the three programs, several broadly applicable promising practices and lessons learned emerged.

In addition, the evaluation conducted an outcomes study of MAPTS program participants that suggests positive employment outcomes. Additional research is needed, however, to provide further evidence of immediate and long-term employment benefits as well as the return on investment to employers.

Promising practices and lessons learned

Design industry-targeted, short-term intensive training. Crafting a training program to meet industry-specific needs has multiple benefits. It can engage industry and local employers in program design and operations in addition to meeting specific workforce needs. It also provides participants with a clear opportunity and path to an occupation with identifiable skill requirements and well-defined job conditions and wages. Shaping the program as a short-term, intensive training can facilitate enrollment and completion and quickly put participants into the workforce with skills employers need (Hendra et al., 2016). This is particularly helpful for adult learners who often cannot put work and life on hold to pursue a postsecondary degree. The Mining Mill Operations and MAPTS programs are clear examples of such a program.

Build programs that accommodate adult learners with low basic skills. Two of the programs did not require placement tests, choosing instead to use formal and informal assessments to counsel students about potential academic or nonacademic challenges prior to admission and to provide admitted students with supports to complete the program. Importantly, remedial courses were not required. This eliminated the need for some students to spend time and money catching up on basic skills that may be only tangentially related to the program's specialized content.

Structure programs to deliver experiential learning and ample hands-on training. Today, the mining industry and many other industries require workers with specific occupational skills and a clear understanding of safety protocols. It is important that training programs simulate the worksite both to train workers how to use specialized equipment and to acclimate them to workplace conditions and norms. Creating a program that offers these opportunities can be costly, especially in the mining industry. However, working with industry and local employers in program design and operations can lead to donations of equipment and other resources that can help build the necessary training environment. In return, employers access a pool of candidates who are prepared for worksite conditions and who have had an opportunity to make an experienced-based decision about whether the job will be a good fit for them before employers incur onboarding costs.

Proactively support participant success from recruitment through entry into the workforce. Meeting industry needs requires producing sufficient numbers of qualified graduates to warrant the

engagement of employers. Building intentional supports, both academic and nonacademic, into a program is essential for success (College Counts, 2018). These include helping participants gain needed financial assistance, access dedicated tutors with specialized content knowledge, address personal needs, and secure job development and placement assistance that extends to providing guidance to foster job retention and advancement. To deliver comprehensive supports it is important for every member of the faculty and staff to take an active role. When supports are integrated directly into the curriculum it ensures that students can access and benefit from them, rather than referring students to general college support services that may not align well with program participants' specific needs.

Distribute partnership engagement responsibilities across all faculty and staff members. Hiring program faculty and staff members with extensive experience or deep relationships with local employers and community stakeholders helps build committed partnerships through multiple points of contact—from general managers to midlevel supervisors to human resources staff members. Frequent, coordinated contact builds trust when the program demonstrates that employer and stakeholder input is taken seriously and alumni meet expectations.

Commit to targeted recruitment. Two programs intentionally sought to serve veterans and Alaska Natives. In both instances, the programs took direct action to reach out to the population and engaged faculty and staff members who had experience and connections with the populations to lead recruitment efforts. This emphasis on focused, face-to-face recruitment served the programs well. Additionally, a strategy to build a partnership with a regional Native group paid off, with the group assisting in recruitment by helping identify candidates, conducting interviews and screening, and eventually providing resources to selected students such as helping them pay for travel to and from the program.

Areas for future research

Conduct rigorous evaluations of UA TAACCCT programs and other mining career training programs. Provided the programs are sustained, a larger number of participants could enable additional quasi-experimental designs that produce causal estimates of the programs' impacts on educational and workforce outcomes. In addition, a longer-term study of MAPTS employment outcomes is important to validate the impacts of the programs.

Evaluate community impacts of training programs. Providing training for and placing individuals in high-wage jobs is likely to have effects that extend beyond the individual to his or her community in terms of economic development and associated health, education, criminal justice, and other outcomes. This is especially important for programs serving target populations, such as rural or Alaska Native students and for communities with high levels of unemployment (Gray, Hunter, & Biddle, 2014).

Evaluate employer impacts and return on investments. Employers can reap many rewards from hiring employees who are specifically trained according to industry needs and committed to working and living in the state. This can include increased employee retention and productivity and even reductions in safety issues that delay work, damage equipment, or cause workplace injuries. Such studies could provide evidence of the economic value in training programs and motivate employers to partner in similar efforts.

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Appendix A: Program logic models

Mining Mill Operations program logic model

Goals

- Increase number of skilled workers in the Alaska mining industry with nation's first mill operator training program.
- Increase the employability of TAA-eligible, Alaska Native, nontraditional student, and unemployed Alaskans.

Inputs

- Facilities; TAACCCT funds; staff experienced with mining industry; administrative staff; existing partnerships

Activities	Outputs
Develop recruitment plan	
• Hold a program open house • Make presentations to military at local ACAP meetings • Coordinate with job centers to locate qualified participants • Promote program to university engineering students • Promote program on Alaska Native communities' job boards	# of program applicants per year # of program enrollees per year
Design curriculum with industry input	
• Obtain industry feedback on curriculum	# of curriculum reviews from mining companies
Provide student supports	
• Provide graduate student tutors • Create e-learning modules • Provide academic and career advising	# of graduate student tutors # of students tutored # of lectures, exams, and other materials online % of enrollees completing program per year # of advising sessions held per participant
Partner with employers	
• Promote program at association conferences • Communicate with industry human resources representatives • Communicate with mining general managers • Organize field trip to mines	# of conferences attended # of meetings with general managers and human resources representatives # of field trips to mines # and % of completers employed per year # and % of previously employed participants receiving wage increases after program completion

Continued on p. A-2

Outcomes

Participants will:

- Increase their understanding of the mining industry (short-term)
- Increase their understanding of the mill operator process (short-term)
- Improve their employability (medium-term)
- Increase opportunities for additional educational attainment (medium term)

UAF will:

- Improve collaboration between academic departments and the CTC program (short-term)
- Improve relationships and communications with mining industry (short-term)
- Increase awareness of the Mining Mill Operations program (medium-term)
- Create marketable intellectual property (medium term)
- Increase its name recognition in the field of mineral processing and mill operations (long-term)

Mines will:

- Increase their employee retention rates (medium-term)
- Incorporate improved training tools for employees (medium term)
- Improve alignment between hiring cycles and Mining Mill Operations program (medium-term)

Mining and Petroleum Training Services (MAPTS) logic model

Goals

- Increase number of skilled workers in the Alaska mining industry.
- Increase the employability of TAA-eligible, Alaska Native, nontraditional student, and unemployed Alaskans.

Inputs

- Facilities; TAACCCT funds; staff experienced with mining industry; administrative staff; existing partnerships with mining companies

Activities	Outputs
Develop recruitment plan	
• Recruit candidates with conditional job offers from mines • Obtain referrals from Alaska Native corporations	# of employer referrals per year # of meetings with Alaska Native corporations per year # of program applicants per year # of program enrollees per year
Design curriculum with industry input	
• Collect information from mines on common employee skill gaps • Collect information from mines on participant performance	# of feedback forms collected from mines # of employer requests incorporated into curriculum

Continued on p. A-3

Activities	Outputs
Provide student supports	
• Maintain a 2-to-1 student/instructor ratio • Provide student advising and monitor student progress • Provide emotional counseling and life skills training • Provide medical assistance • Assist students with reading comprehension • Provide career counseling and assist students with job placement • Provide post-program mentoring and support • Provide job skills training in teamwork, work-life balance, and working in a multicultural workplace	% of participants using support services during program % of participants using support services post-program % of enrollees completing program # of advising sessions per participant
Partner with employers	
• Promote program at association conferences and other venues • Provide informal updates on participant progress to employers • Seek regular employer feedback on program content and alumni performance	# of presentations given # of communications with mines # and % of completers employed per year # and % of previously employed participants receiving wage increases after program completion

Outcomes

Participants will:

- Increase their understanding of the mining industry (short-term)
- Improve their employability (medium-term)
- Increase opportunities for additional educational attainment (medium-term)
- Obtain Mine Safety and Health Administration credentials and an Underground Mining certificate (short-term)

MAPTS will:

- Maintain and improve relationships and communications with mining industry (short-term)
- Increase awareness of the MAPTS program (medium-term)

Mines will:

- Increase employee retention rate (medium-term)
- Improve mine safety (medium-term)
- Improve employee advancement and wages (medium-term)

Mine Mechanic program logic model

Goals

- Increase number of skilled mine mechanics in the Alaska mining industry.
- Increase the employability of TAA-eligible, Alaska Native, nontraditional student, and unemployed Alaskans.

Inputs

- Facilities; TAACCCT funds; faculty experienced with mining industry; industry partnerships

Activities	Outputs
Develop recruitment plan	
• Develop and distribute promotional materials • Coordinate with DOLWD to locate qualified participants • Conduct community outreach in Southeast Alaska • Promote program at veteran's club and advisory task force • Promote program in juvenile justice and vocational rehabilitation centers • Promote program to Native corporations and villages • Promote program at industry conferences	# of promotional materials # of places promotional materials sent to # of meeting with DOLWD per year (quarterly) # of communities contacted by email, phone, and in person # of presentations # of weekly breakfasts attended # of conferences attended/presented at
Design curriculum with industry input	
• Obtain industry feedback on curriculum	# of curriculum reviews from mines
Provide student supports	
• Provide academic and career advising • Follow-up with program completers	# of unique types of student services provided % of enrollees completing program per year # of advising sessions held per participant # of alumni contacted/engaged

Continued on p. A-5

Activities	Outputs
Partner w/ employers for hiring and recruitment	
• Promote program at annual advisory meeting • Participate in community relations activities • Communicate with industry human resources representatives • Communicate with mining general managers • Faculty visits to mines • Coordinate fundraising events/opportunities • Sustain internship and job shadow opportunities	# of companies engaged # of industry/company representatives attended # of outreach visits attended # of faculty visiting mines/year # of mines visited/year # of donations; amount of donations; # of companies donating % of participants placed in internships; % job shadowing % of completers employed per year # and % of previously employed participants receiving wage increases after program completion

Outcomes

Participants will:

- Increase their understanding of the mining industry (short-term)
- Increase their understanding of mine mechanic career options (short-term)
- Increase high-demand skills such as welding (short-term)
- Improve their employability (medium-term)
- Increase opportunities for additional educational attainment (medium term)

UAS will:

- Increase its ability to offer courses to a larger number of students (medium-term)
- Increase its ability to offer flexible options for students to take courses (medium-term)
- Improve its facilities and visibility (medium-term)
- Expand credential options (e.g., welding OE) (medium-term)

Mines will:

- Increase their employee retention rates (medium-term)
- Incorporate improved training tools for employees (medium term)

Appendix B: Outcomes study data and methods

This appendix provides a description of the data and analytic methods used to evaluate the outcomes of the Mining and Petroleum Training Services (MAPTS) Surface Mining and Underground Mining programs. It describes the research questions, data sources, and key variables used in the analysis; characteristics of the program participant and comparison samples; and the analytic strategies employed to obtain the study's results.

Evaluation questions

The study's three evaluation questions (see p.4) were based on the nine outcome measures required by U.S. Department of Labor for TAACCCT grantees. These are:

Participation and completion:

1. Total unique participants served/enrolled
2. Total number of participants who have completed a TAACCCT-funded program

Educational attainment:

3. Total number of participants still retained in their program of study or another TAACCCT-funded program
4. Total number of participants completing credit hours
5. Total number of participants earning credentials
6. Total number of participants enrolled in further education after grant-funded program of study completion

Employment outcomes:

7. Total number of participants employed after grant-funded program of study completion
8. Total number of participants retained in employment after program of study completion
9. Total number of those participants employed at enrollment who receive a wage increase post-enrollment

Data

The data to address the outcomes study research questions came from two sources. The University of Alaska Fairbanks (UAF) provided data on program participants, including their enrollment status and degree completion throughout the University of Alaska system between the 1999–2000 and 2017-18 school years. This dataset was used to address the first two evaluation questions regarding participation and completion, and educational attainment. The Alaska Department of Labor and Workforce Development (DOLWD) provided data for program participants and a comparison sample of Alaska employees from the third quarter of 2010 through the first quarter of 2018. This data was used to address the third evaluation question on employment outcomes.

Two data collections from DOLWD provided information about individuals for this study. First, the Quarterly Census of Employment and Wages (QCEW) is a federally required collection of employment

and wage records reported to DOLWD by employers. This collection includes records on most individuals employed in Alaska. It excludes federal employment (both military and civilian), independent contractors, and fish harvesters. The QCEW provided quarterly data on employment status (employed or not), industry and occupation, geographic location of employment (eight economic regions), and wages earned. The other DOLWD data collection is the Permanent Fund Dividend (PFD), an annual collection that included data from 2007 through 2017 in the study's dataset. The PFD is a fund that collects taxes from oil and gas companies, an amount of which is distributed to Alaska residents annually. To receive the PFD payout, Alaskans must provide proof of residency in the state and must be located in the state for 185 days of the year (Alaska Department of Revenue, 2018). This dataset provided proof of Alaska state residency, birth date, and gender. Table B1 summarizes the data sources and key outcome and covariate variables organized by research question.

Table B1. Data sources, sample, and key variables for the three evaluation categories

Evaluation category	Data source	Sample	Outcome variables	Additional variables
Participation and completion **Educational attainment**	University of Alaska Fairbanks	MAPTS participants	• MAPTS enrollment and completion dates • Enrollment in any University of Alaska course after MAPTS participation • Credits earned • Credential or degree earned	• Birth date • Gender • Race/ethnicity • Home city and state • Trade Adjustment Assistance eligibility • Veteran status
Employment outcomes	Alaska Department of Labor and Workforce Development	MAPTS participants and comparison group	• Average quarterly wage two quarters after program completion • Average quarterly wage four quarters after program completion • Reported as employed in both of the first two quarters • Reported as employed for all of the first four quarters after program completion • Industry and occupation	• Average quarterly wages earned in the four quarters prior to program participation • Most recent quarterly wage earned (since 2010, quarter 3) • Census area and region of Alaska of most recent employer • Number of quarters worked in the 16 quarters prior to program enrollment • Gender • Birth date • Alaska residency

Source: Authors.

Sample

Due to the very short length of the program and high completion rates, the study used an "intent to treat" model that considers all individuals who had exposure to the MAPTS program in the analytic sample, including the three participants that did not complete the program and one who was reported deceased after completing the program. This produces more conservative estimates of the effect of the program. However, as discussed in the main body of the report, due to data collection and reporting lags, employment outcomes four quarters after program completion were not observed for 13 (22 percent) Underground Mining participants and 10 (31 percent) Surface Mining participants who completed the MAPTS program after March 2017. Education outcomes through spring semester 2018 and employment outcomes up to two quarters after program completion were available for all cohorts. Descriptive analyses and the matching study included different samples, due to the constraints of linking data across datasets maintained by different agencies and the design of analytic models. Each is briefly described in this section.

Descriptive analysis

The analytic sample for descriptive analyses includes all 61 Underground Mining participants and 32 Surface Mining participants. Students who were not found in UAF or DOLWD databases were counted as not enrolled or not employed.

Matching analysis

MAPTS program participation data were linked to Alaska DOLWD records. All but three Underground Mining participants and one Surface Mining participant were found in DOLWD records, for a starting sample of 58 Underground Mining participants and 31 Surface Mining participants. The potential comparison group included a starting sample of 805,975 Alaskans with PFD or QCEW records between 2010 and 2018. The sample was trimmed by removing individuals who were enrolled in other TAACCCT programs or had birth years or prior wages earned that were far out of the range of values in the participant sample. In addition, the comparison sample for each cohort was trimmed so that it included individuals who had not worked in natural resource extraction (including mining) or construction until after participants completed their training. After trimming, approximately 373,000 individuals remained in the Underground Mining comparison sample and approximately 317,000 individuals in the Surface Mining comparison sample. After matching, the sample included 43 Underground Mining participants who were matched to 6,832 individuals from the comparison sample, and 27 Surface Mining participants who were matched to 2,610 individuals from the comparison sample.

Sample selection and data limitations

Because a randomized controlled trial was not feasible for this study, evaluators selected a comparison sample to create a counterfactual that approximates the wage and employment outcomes of MAPTS participants had they not received the program's training. The most appropriate comparison sample for MAPTS participants consists of Alaskans who entered the industries MAPTS participants most often enter after completing the program—natural resource extraction and construction—at the same time as MAPTS participants completed the program. The comparison group was established using data from DOLWD.

While many matching studies involving college or career training programs derive a comparison

group from other college students, this would be inappropriate for this study for several reasons. First, because entry-level mining extraction and construction jobs typically require no more than a high school diploma and workers may enter these jobs without any formal training, a comparison sample limited to other college students would be highly vulnerable to omitted variable bias due to unobservable differences in academic motivations, family commitments and supports, and career aspirations between MAPTS participants and students in postsecondary programs resulting in a degree. Further, comparisons of prior academic achievement would be unobservable since MAPTS does not require admissions tests, collect high school or college transcripts, award credit, or assign grades.

Second, UA does not offer a similar short-term career training program in mining or related industries that did not receive TAACCCT funding. Therefore, MAPTS participants would need to be matched to students in longer degree-granting programs and to students enrolled in programs for unrelated industries. This is problematic because many people may not be interested in or capable of work in mining and construction jobs that typically require physical qualifications (such as lifting 40 pounds and passing frequent drug tests), have safety risks, and may require extended periods of time away from home. Additionally, mining and construction positions typically pay higher wages than jobs in many other industries in Alaska, so estimates of MAPTS training effects on wages would likely be overestimated if comparisons were made with individuals entering fields with lower average wages. Finally, since the goal of noncredit MAPTS programs is to place students in employment immediately rather than to prepare them for further postsecondary education, estimating the effect of MAPTS training on educational attainment using a comparison group of other college students does not align with the intended outcomes of the program model.

The primary limitation of this approach is that indicators of race/ethnicity and education level were not available for the comparison sample because they are not collected by DOLWD. U.S. Census data show that MAPTS has a composition of Alaska Native individuals that is 39 percentage points higher than the state average (54 percent compared to 15 percent; U.S. Census Bureau, 2017). It also has a composition of individuals with at least an associate degree that is 32 percentage points lower than the state average (4 percent compared to 36 percent, Sandberg, 2017). Both of these characteristics are associated with lower average wages in Alaska (Hanson & Pierson, 2016). If participants were matched to comparison sample individuals from demographic groups that tend to earn higher wages, this suggests that the results could be underestimating the difference in wages between MAPTS participants and their matched peers. To the extent that wages are associated with job retention (Smart & Chamberlain, 2017), both outcomes in the study could be underestimated.

Despite this limitation, evaluators determined that a comparison sample based on the most logical counterfactual of obtaining a job in the same or related industry without MAPTS training could generate more meaningful and accurate interpretations of the program's effects than conclusions based on a comparison sample limited to college students who are likely to be substantially dissimilar from MAPTS participants in observable and unobservable ways. While this limitation means that the study is ineligible for review by the Clearinghouse for Labor Evaluation and Research, it provides valuable evidence to suggest relationships between MAPTS training programs and positive employment and wage outcomes for participants. Future research should address this limitation to establish peer-reviewed causal evidence of the program's impacts.

Analytic Methods

Program participation and educational attainment

Evaluators used descriptive analysis (for example, percentages and averages) to summarize the demographic composition of MAPTS participants and their educational outcomes. Results were disaggregated by program (Surface Mining and Underground Mining).

Employment outcomes

Evaluators summarized employment outcomes for participants two and four quarters after they attended the program using descriptive statistics, such as frequencies, percentages, and averages. Because a randomized control trial was not feasible for this study and sample sizes were too small to model differences in wages and employee retention over time within individual students, the evaluation team approximated a fully blocked randomized experimental design, MAPTS participants were matched with nonparticipants using a coarsened exact matching (CEM) procedure to generate counterfactuals. CEM has certain advantages. For example, it does not rely on modeling assumptions like the commonly used propensity score matching technique—a procedure that is ill fitted to interventions with small sample sizes—and it performs at least as well as other matching methods in its ability to reduce imbalance between treatment and comparison groups, model dependence, estimation error, and bias (Iacus, King, & Porro, 2012). In addition, it enables the evaluator to set limits on the amount of imbalance allowed between treatment and comparison groups for each variable included in the matching procedure.

The CEM procedure has four steps. First, evaluators identified covariates to use in the matching procedure, including wage and employment history, geographic location, gender, and age. Second, evaluators coarsened continuous and categorical covariates into distribution- and theory-informed groups. Exact matches were required for gender and geographic region, while bandwidths were set to limit variation between treatment and comparison groups in terms of birth year, wage history, and employment history. Third, the "exact matching" algorithm was applied to the coarsened data to determine the matches and prune unmatched individuals. Fourth, the coarsened data were discarded and the original values of the matched data were retained.

The matching procedure assigns a weight to each observation from the comparison sample that denotes how similar the matched pairs are. Subjects that are not matched are assigned a weight of zero. Treatment subjects that are matched are assigned a weight of 1. Each comparison group subject receives a weight that is the product of the total number of comparison group subjects divided by the total number of treatment groups in a stratum. For example, if a stratum has 1 MAPTS participant and 10 comparison group subjects, the MAPTS participant receives a weight of 1 and each of the comparison group subjects receive a weight of 0.1. These weights are applied in a regression analysis that uses the actual values for each individual.

Each cohort of Surface Mining and Underground Mining participants were matched to the comparison sample separately so that baseline variables could be adjusted to the quarter immediately preceding each cohort's participation in the training. For example, for an Underground Mining program held during the third quarter of 2015, pre-treatment variables would be measured through the second quarter of 2015. Since cohorts 2–4 of surface mining program participants completed in the second quarter of 2016 and pre-treatment covariates were measured by quarter, these three cohorts were aggregated for matching.

Prior to matching, the MAPTS participants and trimmed comparison sample were imbalanced across gender, birth year, geographic location, and most recent quarterly wages (table B2). There were differences in average quarterly wages over the prior four quarters and the number of quarters worked during the past 16 quarters, but they were not statistically significant. Nonetheless, they may represent practically meaningful differences that matching can mitigate. After matching, pre-treatment covariates were balanced. Evaluators required exact matches for gender and geographic location; therefore, there is no variation across matched treatment and comparison samples for these variables.

Table B2. Baseline characteristics of treatment and comparison groups for Surface Mining and Underground Mining MAPTS programs

	Unmatched sample			Matched sample		
Pre-treatment characteristic	**Treatment mean (standard deviation)**	**Comparison mean (standard deviation)**	**Difference[a] (p-value)**	**Treatment mean (standard deviation)**	**Comparison mean (standard deviation)**	**Difference[a] (p-value)**
Surface Mining program						
Male (%)	80.65 (40.16)	42.42 (49.42)	38.23 (0.000)	77.78 (42.37)	77.78 (42.37)	0.00
Birth year	1992.29 (9.60)	1979.25 (14.41)	13.04 (0.000)	1992.24 (10.12)	1992.63 (0.95)	−0.39 (0.242)
Geographic region[b]	3.35 (1.36)	4.40 (1.62)	−1.04 (0.000)	3.41 (1.45)	3.41 (1.45)	0.00
Most recent quarterly wages ($)	1,790.99 (2,653.39)	3,806.81 (3,860.07)	−2,015.82 (0.004)	1,604.30 (2,063.44)	1,625.34 (380.74)	−21.04 (0.894)
Average quarterly wages over prior four quarters ($)	7,465.20 (11,024.70)	11,351.87 (15,360.54)	−3,886.67 (0.159)	5,888.75 (7,837.62)	5,631.05 (728.17)	257.70 (0.213)
Number of quarters worked during past 16 quarters	6.16 (5.26)	7.34 (6.06)	−1.18 (0.280)	6.04 (5.22)	6.07 (0.40)	−0.4 (0.715)
Number of observations	31	317,879		27	2,610	

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	Unmatched sample			Matched sample		
Pre-treatment characteristic	Treatment mean (standard deviation)	Comparison mean (standard deviation)	Difference[a] (p-value)	Treatment mean (standard deviation)	Comparison mean (standard deviation)	Difference[a] (p-value)
Underground Mining program						
Male	84.45 (36.52)	43.24 (49.08)	41.24 (0.000)	83.72 (37.35)	83.72 (37.35)	0.00
Birth year	1987.30 (10.60)	1976.56 (15.62)	10.74 (0.000)	1988.61 (9.95)	1988.48 (10.09)	0.12 (0.766)
Geographic region[b]	4.22 (1.80)	4.32 (1.58)	0.10 (0.641)	3.86 (1.68)	3.86 (1.68)	0.00
Most recent quarterly wages ($)	4,796.99 (4,642.62)	4,784.90 (4,793.30)	12.08 (0.985)	4,670.60 (4,012.33)	4,637.92 (3,990.78)	32.69 (0.766)
Average quarterly wages over prior four quarters ($)	18,364.34 (16,914.67)	14,641.52 (19,316.43)	3,722.83 (0.142)	16,083.76 (15,281.41)	15,823.75 (14,848.32)	260.01 (0.180)
Number of quarters worked during past 16 quarters	8.86 (5.00)	7.94 (6.21)	0.920 (0.259)	9.19 (4.91)	9.15 (4.84)	0.035 (0.658)
Number of observations	58	373,678		43	6,832	

[a]Some differences are not exact due to rounding.
[b]Regions are numbered from 1 to 8 based on economic regions in Alaska.

Note: P-values less than 0.05 are statistically significant. P-values are not calculated for exact matches (male and geographic region).

Source: Authors' analysis of Alaska Department of Labor and Workforce Development records.

As with the matching procedure, evaluators conducted regression analysis separately for Surface Mining and Underground Mining students. Additionally, each of the employment outcome estimates was generated by a separate regression model to account for the different distributional properties of the outcome variables. Specifically, wages earned two and four quarters after program completion are continuous variables modeled with an ordinary least squares regression, as shown in equation 1.

$$(1) \qquad Y_i = \alpha + \beta_1 MAPTS_i + \boldsymbol{\theta X}_i + \varepsilon_i$$

where Y_i represents the wages of individual i either two or four quarters after program participation, MAPTS is a binary indicator for whether individual i participated in MAPTS, $\boldsymbol{X}_i$ represents a vector of characteristics including gender, birth year, geographic region, most recent quarterly wages, average quarterly wages over the prior four quarters, and number of quarters worked during the past 16 quarters. ε is an error term with robust standard errors clustered by MAPTS cohort.

Remaining employed for two or four consecutive quarters are binary variables that were modeled using logistic regression, as shown in equation 2.

$$(2) \qquad ln\left(\frac{p}{1-p}\right) = \alpha + \beta_1 MAPTS_i + \boldsymbol{\theta X}_i$$

where *ln* refers to the natural logarithm of the probability of retaining employment for two or four consecutive quarters after program participation, MAPTS is a binary indicator for whether individual i participated in MAPTS, $\boldsymbol{X}_i$ represents a vector of characteristics including gender, birth year, geographic region, most recent quarterly wages, average quarterly wages over the prior four quarters, and number of quarters worked during the past 16 quarters.

Full regression results are presented in tables B3 and B4.

Table B3. Regression results for employment outcomes two quarters after program participation for all cohorts and for cohorts that completed the program before March 2017

	Average quarterly wages two quarters after program completion ($)		Probability of retaining employment two quarters after program completion	
Variable	**All cohorts** Coefficient (robust standard error)	**Cohorts completed before March 2017** Coefficient (robust standard error)	**All cohorts** Odds ratio (standard error)	**Cohorts completed before March 2017** Odds ratio (standard error)
Surface Mining				
Participated in MAPTS	2,273.698** (855.301)	2,286.82 (1214.047)	59.240*** (36.988)	22.136** (21.369)
Male	−6.181 (99.959)	548.889 (335.097)	0.319** (0.106)	0.070*** (0.035)
Birth year	−58.952* (27.203)	−31.414 (37.669)	0.794*** (0.032)	0.891** (0.036)
Geographic region[a]	−13.957 (33.148)	−95.254 (69.017)	1.423*** (0.097)	2.472*** (0.395)
Most recent quarterly wages ($)	−0.243 (0.099)	−0.271* (0.106)	1.0002*** (0.00005)	1.0002* (0.00007)
Average quarterly wages over prior four quarters ($)	0.085 (0.049)	0.049 (0.049)	0.9998*** (0.00003)	0.99998 (0.00005)
Number of quarters worked during past 16 quarters	14.560 (46.555)	66.662 (79.773)	2.086*** (0.092)	2.220*** (0.225)
Number of participants	27	19	27	19
Number of matched comparison observations	2,610	877	2,610	877

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	Average quarterly wages two quarters after program completion ($)		Probability of retaining employment two quarters after program completion	
Variable	**All cohorts** Coefficient (robust standard error)	**Cohorts completed before March 2017** Coefficient (robust standard error)	**All cohorts** Odds ratio (standard error)	**Cohorts completed before March 2017** Odds ratio (standard error)
Surface Mining				
R-squared/Pseudo R-squared	0.0723	0.1218	0.6464	0.7220
Underground Mining				
Participated in MAPTS	6026.241*** (1014.505)	6828.47*** (1,185.807)	7.446*** (3.848)	18.744*** (11.957)
Male	52.961 (465.729)	204.512 (543.086)	0.134*** (0.034)	0.074*** (0.022)
Birth year	−14.774 (23.071)	-8.441 (27.382)	1.037*** (0.008)	1.024** (0.009)
Geographic region[a]	372.142† (202.902)	506.229* (246.224)	1.432*** (0.061)	1.534*** (0.077)
Most recent quarterly wages ($)	0.050 (0.109)	0.069 (0.123)	1.00003 (0.00002)	0.99992*** (0.00002)
Average quarterly wages over prior four quarters ($)	0.249*** (0.029)	0.239*** (0.034)	1.0001*** (0.00006)	1.0002*** (0.000008)
Number of quarters worked during past 16 quarters	34.263 (87.955)	89.027 (106.751)	1.582*** (0.033)	1.611*** (0.037)
Constant	27396.32 (46057.79)	13665.64 (54819.59)	0.000*** (0.000)	0.000** (0.000)
Number of participants	43	32	43	32
Number of matched comparison observations	6,832	6,715	6,832	6,715
R-squared/Pseudo R-squared	0.7809	0.7875	0.5966	0.6469

† p < 0.1, *p < 0.05, **p < 0.01, ***p < 0.001.

[a]Regions are numbered from 1 to 8 based on economic regions in Alaska.

Source: Authors' analysis of Alaska Department of Labor and Workforce Development data.

Table B4. Regression results for employment outcomes four quarters after program participation for cohorts completing the program by March 2017

Variable	Average quarterly wages four quarters after program completion Coefficient (robust standard error)	Probability of retaining employment four quarters after program completion Odds ratio (standard error)
Surface Mining		
Treatment	1,844.415 (428.512)	1.246 (1.152)
Male	428.512 (279.760)	0.056*** (0.037)
Birth year	−34.740 (29.538)	1.009 (0.025)
Geographic region[a]	−35.135 (58.538)	1.891** (0.303)
Most recent quarterly wages ($)	−0.248** (0.083)	1.0002** (0.00007)
Average quarterly wages over prior four quarters ($)	0.063 (0.040)	0.9999 (0.00005)
Number of quarters worked during past 16 quarters	31.098 (67.244)	2.383*** (0.276)
Constant	70,273.90 (59,043.25)	0.000 (0.000)
Number of participants	19	19
Number of matched comparison observations	877	877
R-squared/Pseudo R-squared	0.1114	0.7242
Underground Mining		
Treatment	7,630.418*** (1,207.005)	9.385*** (5.664)
Male	−43.050 (485.744)	0.490** (0.134)
Birth year	11.078 (22.035)	0.983* (0.008)
Geographic region[a]	375.679 (252.732)	1.725*** (0.093)

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Most recent quarterly wages ($)	**0.086** **(0.123)**	**0.9998***** **(0.00002)**
Average quarterly wages over prior four quarters ($)	**0.235***** **(0.034)**	**1.0002***** **(0.000008)**
Number of quarters worked during past 16 quarters	**59.696** **(109.185)**	**1.365***** **(0.031)**
Constant	**−22,280.74** **(44,512.78)**	**0.000** **(0.000)**
Number of participants	**32**	**32**
Number of matched comparison observations	**6,715**	**6,715**
R-squared/Pseudo R-squared	**0.7857**	**0.6320**

† p < 0.1, *p < 0.05, **p < 0.01, ***p < 0.001.

[a]Regions are numbered from 1 to 8 based on economic regions in Alaska.

Source: Authors' analysis of Alaska Department of Labor and Workforce Development data.