

# **Pathways for Alternative Energy Automotive Technicians: Year 3 Evaluation Report**

**Prepared for:**

Steve Levin  
Principal Investigator

Columbus State Community College  
550 East Spring Street  
Columbus, OH 43215

**Prepared by:**

The Rucks Group, LLC  
714 E. Monument Avenue  
Dayton, OH 45402

July 2019

This material is based on work supported by the National Science Foundation NSF Proposal #1600689. The opinions, findings, conclusions, or recommendations expressed in this material are those of the authors and do not reflect the position or policies of the National Science Foundation.

## Executive Summary

Columbus State Community College (Columbus State), with funding from the National Science Foundation's Advanced Technical Education (NSF ATE) directorate, created an Alternative Energy Automotive Technology career pathway. By developing new technicians and elevating the existing workforce, the project aims to: 1) increase the supply of skilled technicians by creating a pathway from high school to two-year, and potentially four-year degree programs and/or employable exit points; 2) expand the pool of qualified students entering the automotive program from various and non-traditional backgrounds by involving targeted high school students early in STEM; 3) increase the number of students enrolled in the Automotive Technology program at Columbus State; 4) disseminate the model regionally for replication at other institution; 5) expand existing TechLINK Cooperative Work Experience with an additional focus on alternative energy diagnosis and repair; and 6) provide professional development for teachers/faculty and engage high school faculty in alternative energy automotive technology education.

The team continued moving forward on the project in Year 3 with many notable accomplishments. Three new courses focusing on the operation, diagnosis, and repair of alternate and hydrogen-fueled vehicles were developed and implemented. The team was successful in purchasing and acquiring new equipment that will allow students to get hands-on experience with the kind of equipment that they will see on the job. The project team also made good progress in their outreach efforts by targeting younger students through their assistance with the development and implementation of the Ohio Environmental Protection Agency (OEPA) funded effort called Fueling our Futures. The project team successfully developed and implemented professional development opportunities, including the Alternative Fuel Vehicle Extraction (AFVE) workshop for first responders and the Automotive Instructor's Workshop, which led to knowledge increases. Project team members continued to work with their Industry Leadership Team to gain their perspective on project initiatives including recruitment strategies for increasing awareness among prospective students of the opportunities for good-paying positions and careers in servicing alternative fueled vehicles. Faculty on the team joined several professional organizations in Year 3 such as the National Alternative Fuels Training Consortium which will help the team to establish more connections within the industry to stay current with the latest technologies and gain a better understanding of the knowledge and skills that are in demand. The project team has obtained a six-month extension in order to run another AFV workshop and educator workshop.

We have a few recommendations for the team as they complete these efforts and close out the project at the end of 2019. Discussions with the project team regarding the potential reasons for low passage rates on the 596 Multimeter certification revealed that instructors believed this certification to be too product-specific and did not want to take time away from teaching students the more important practical knowledge and skills related to diagnosis and intervention. Based on this important insight we recommend that the project team look at each of the certifications to determine if the course time being devoted to it is in the best interests of students. For certifications that would truly benefit students, the team should find ways to convey these benefits such as testimonials from program graduates or through class discussions with guest employers. Other, more immediate, incentives such as extra credit for passing certification exams might also be considered. The project team also should work to identify new strategies for attracting students into the program. A good first step would be to gather specific information from enrolled Automotive students regarding how they heard about the program and what factors contributed most to their decision to enroll in the automotive technician program at Columbus State. Finally, we recommend that the project team remain in contact with students who graduate from the program. These individuals will be important sources of information regarding what the automotive program is doing well and what they could do better in terms of recruiting prospective students into the program and preparing them effectively for jobs in the alternative automotive technician field. In addition, successful graduates have the potential to become the most effective advocates for the automotive program.

# Table of Contents

- Executive Summary .....2
- Background .....4
- Purpose and Design of the Evaluation .....5
- Findings.....6
  - Evaluative Question #1: How effectively is the project being implemented? What obstacles are being experienced? To what extent are the stated goals and objectives being achieved? .....6
    - Automotive course development and implementation .....6
    - Industry Leadership Team Meetings .....7
    - First Responder Workshop .....7
    - Purchasing of Equipment.....9
    - Recruitment and Outreach Activities .....9
  - Evaluative Question #2: How has the pool of qualified students entering the automotive program expanded? To what extent was the pool expanded by students drawn from non-traditional backgrounds? ..... 10
    - Industry-recognized Certifications ..... 12
    - Recruitment of Non-traditional Students ..... 13
  - Evaluative Question #3: To what extent is the model being disseminated regionally? How is the model being used by other entities? ..... 15
  - Evaluative Question #4: How satisfied are teachers and faculty with professional development activities? To what extent are teachers and faculty incorporating lessons learned from professional development activities into their classrooms? ..... 15
  - Evaluative Question #5: What is the project budget versus the actual expenditures? What is the estimated return on investment of the grant funds? ..... 18
  - Evaluative Question #6: What were the significant unanticipated outcomes?..... 18
- Recommendations ..... 18
- References.....20
- Appendix A - Pathways for Alternative Energy Automotive Technicians Logic Model.....21
- Appendix B - Project Pathway .....22
- Appendix C - AFVE Workshop Participant Survey .....23
- Appendix D - Automotive Course Feedback.....24
- Appendix E - Automotive Instructor’s Workshop .....27

## Background

Columbus State Community College (Columbus State) is working in collaboration with Clean Fuels Ohio, the Center for Automotive Research at The Ohio State University, local high school districts and technical centers, several industry partners, and previously awarded NSF ATE projects at Owensboro Community & Technical College, Macomb Community College's Center for Advanced Automotive Technology (CAAT), and the Center for Aviation and Automotive Technical Education using Virtual E-School (CA2VES) at Clemson University to implement a career pathway in Alternative Energy Automotive Technology and related curriculum. The curriculum will optimize emerging techniques and technologies including project-based learning, integrated learning objects, and a STEM-intensive curriculum that incorporates education in technology, engineering, automotive, and mathematics to prepare a technical workforce appropriately educated to support the increasing market for alternative energy automotive technicians.

The skills required for an automotive technician continue to advance with innovations in the automotive industry and increased computerization of systems. To meet these new demands, technicians must have strong academic and diagnostic skills. Emerging trends in hybrid and alternative energy technology have led to a shortage in the high skilled and journeyman workforce. By developing new technicians and elevating the existing workforce, graduates can secure high wage positions as alternative energy automotive technicians. Therefore, the project has the following six (6) objectives:

1. Increase the supply of skilled technicians by creating a pathway from high school to two-year, and potentially four-year degree programs and/or employable exit points.
2. Expand the pool of qualified students entering the automotive program from various and non-traditional backgrounds by involving targeted high school students early in STEM.
3. Increase the number of students enrolled in the Automotive Technology program at Columbus State.
4. Disseminate the model regionally for replication at other institutions.
5. Expand existing TechLINK Cooperative Work Experience with an additional focus on alternative energy diagnosis and repair.
6. Provide professional development for teachers/faculty and engage additional high school faculty in alternative energy automotive technology education.

A total of four (4) courses were enhanced with an additional focus on alternative energy leading to the AAS Degree in Automotive Technology and Master Automotive Service Technician Certificate (MAST). Further, two (2) new courses for Hybrid and Alternative Fuels (CNG, H2, etc.) have been developed, leading to a new Alternative Energy Automotive Technology Certificate.

Students completed course activities in the school's automotive lab located on the main campus (see Figure 1) where students have opportunities to work on various cars (i.e., hybrids, electric plug-in, and CNG-powered engines) from local dealerships (either purchased by or donated to Columbus State).



**Figure 1.** Automotive Lab at Columbus State.

Additional deliverables have included a summer workshop giving first responders hands-on opportunities to learn about the unique safety concerns associated with hybrid/electric, compressed natural gas, and hydrogen-powered vehicles and instructor's workshop in the fall to provide educators with information and resources related to alternative energy automotive technology that they can incorporate into their own curriculum.

## Purpose and Design of the Evaluation

The Alternative Energy Automotive Technician project team has contracted with The Rucks Group to provide external evaluation services. The Rucks Group is a six-person research and evaluation firm that gathers, analyzes, and interprets data for clients to measure the impact of their work. The firm provides external evaluation services on several large, multi-year projects funded through the Department of Labor (DOL), National Science Foundation (NSF), and other grant funding agencies.

The evaluation has a two-fold purpose: 1) to capture information regarding the activities of the project for continuous improvement purposes (formative evaluation), and 2) to assess the outcomes of the project (summative evaluation). Essential elements of the evaluation are the project logic model, its objectives, and the evaluative questions. The logic model is a visual overview of the project's hypothesis on how it will achieve its goals. The logic model (see Appendix A) provides the frame for the evaluation, while the evaluative questions guide the nature of the data to be collected. The theory of change underlying the project is that if a quality curriculum in alternative energy automotive technology which aligns with stated industry needs is established and if high school students, women, U.S. military veterans, and minorities are made aware of the existence of the program and opportunities available in the field, then the number of individuals serving as alternative energy automotive technicians will increase.

The evaluative questions to be addressed over the life of the project are:

1. How effectively is the project being implemented? What obstacles are being experienced? To what extent are the stated goals and objectives being achieved?
2. How was the pool of qualified students entering the automotive program expanded? To what extent was the pool expanded by students drawn from non-traditional backgrounds?
3. To what extent is the model being disseminated regionally? How is the model being used by other entities?
4. How satisfied are teachers and faculty with professional development activities? To what extent are teachers and faculty incorporating lessons learned from professional development activities into their classrooms?
5. What is the projected budget versus the actual expenditures? What is the estimated return on investment of the grant funds?
6. What were the significant unanticipated outcomes?

As the project finishes its third year of funding, the project team has successfully implemented modified courses, designed and implemented new courses, conducted Industry Leadership team meetings, hosted professional development workshops, and performed recruitment and outreach activities.

## Findings

### Evaluative Question #1: How effectively is the project being implemented? What obstacles are being experienced? To what extent are the stated goals and objectives being achieved?

During Year three of the project, activities focused on the creation and implementation of two new courses, continuing to conduct Industry Leadership Team meetings, designing and hosting both a first responder workshop as well as a high school faculty professional development workshop, and performing recruitment and outreach for enrollment growth. Implementation of these activities met no major obstacles and are described in further detail below.

#### Automotive course development and implementation

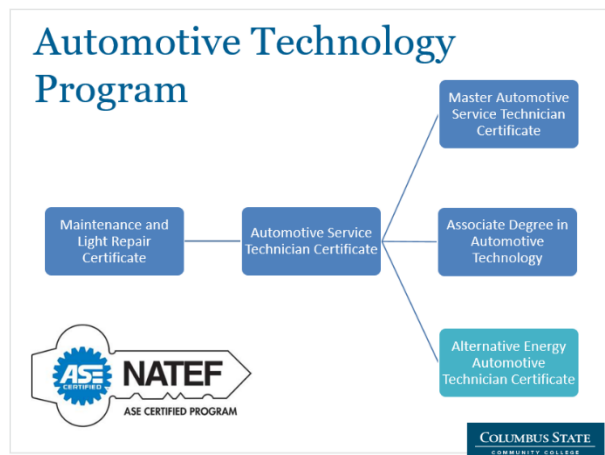
In Year 3, the project team completed the development and implementation of three new courses that focus on alternative energy automotive technology. The AUTO-2190 Hybrid Vehicles: Theory & Operation course had a soft launch during the summer 2018 term and then fully launched in the 2018 fall term. The AUTO-2390 Advanced Hybrid Vehicles: Diagnosis and Repair and AUTO-2391 Advanced Alternative Fueled Vehicles: Diagnosis and Repair courses were fully launched during the spring 2019 term. Equipment and trainers were acquired and incorporated into the courses to enhance the hands-on learning experience for students and to allow them to become familiar with the equipment that they will see on the job.

The project team also continued to deliver the four courses that had been modified during Years 1 and 2 of the project which included targeted information to help students pass various automotive certification exams (e.g., 596 Multimeter Certification). The full list of modified and newly developed courses, along with associated certificates, is shown in Table 1.

Automotive Courses and Certifications Offered During Year 3		
Course Code	Modified Course Title	Associated Certifications
AUTO1106	Auto Shop Orientation and Service	ShopKey Pro Service & Repair Information Level I Certification
AUTO 1160	Electrical Systems: Theory & Operation I	596 Multimeter Certification
AUTO 1180	Engine Performance: Theory & Operation I	Verus Edge Navigation & Scanner Operation
AUTO 2280	Engine Performance: Theory & Operation II	Verus Edge Lab Score Operation & Data Management
Course Code	New Course Title	
AUTO 2190	Hybrid Vehicles: Theory & Operation	N/A
AUTO 2390	Advanced Hybrid Vehicles: Diagnosis and repair	N/A
AUTO 2391	Advanced Alternate Fueled Vehicles: Diagnosis and repair	N/A

**Table 1.** Automotive courses and certifications offered during Year 3

Students' completion of these courses along with additional automotive technology coursework will culminate in the completion of a Master Automotive Service Technician Certificate (MAST), an AAS Degree in Automotive Technology, and an Alternative Energy Automotive Technician Certificate as shown in Figure 2 (also see Appendix B). This credential will provide employers with a clear indication that these students have a solid base of knowledge and the skills required to service the increasing number of alternative-fueled automobiles.



**Figure 2.** Illustration of the certificate sequence.

### Industry Leadership Team Meetings

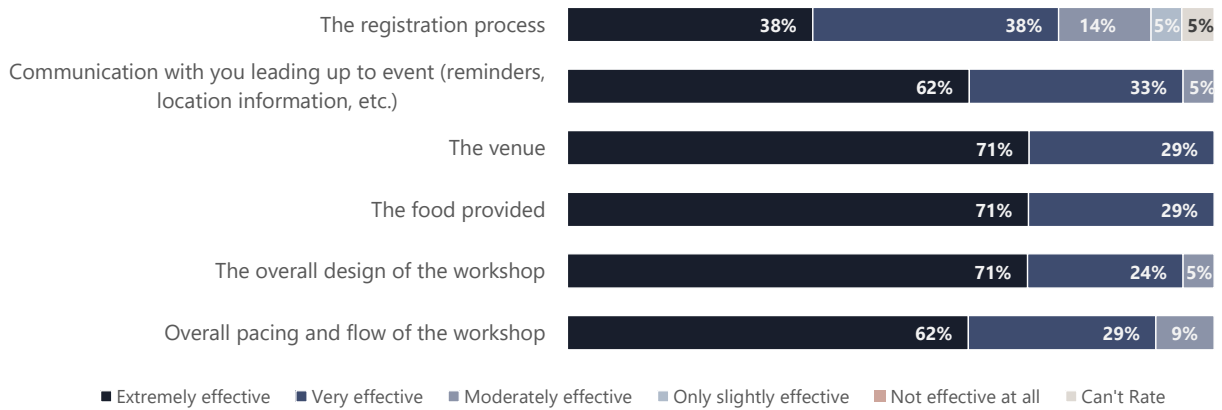
The Industry Advisory Board continued to meet quarterly to provide guidance on the alignment of the Automotive Technology degree program with industry needs and standards, to assist with the development of recruitment strategies to increase awareness among prospective students of the career pathways that exist in the industry, and to reduce the stigma of automotive jobs by informing students and their parents about the benefits of obtaining an Automotive Technology AAS or certificate. Jared Ricart, from the Ricart Automotive Group, was selected to co-chair the committee along with the project's Principal Investigator (PI), Steve Levin.

Project team faculty members also joined three professional organizations including the National Alternative Fuels Training Consortium (NAFTC), the Municipal Equipment Maintenance Association (MEMA), and Clean Fuels Ohio (CFO). Membership in these associations will provide faculty members with opportunities to gain a better understanding of industry needs, exposure to cutting-edge technologies and practices, and forums for disseminating the curricula and educational models developed by the project team.

### First Responder Workshop

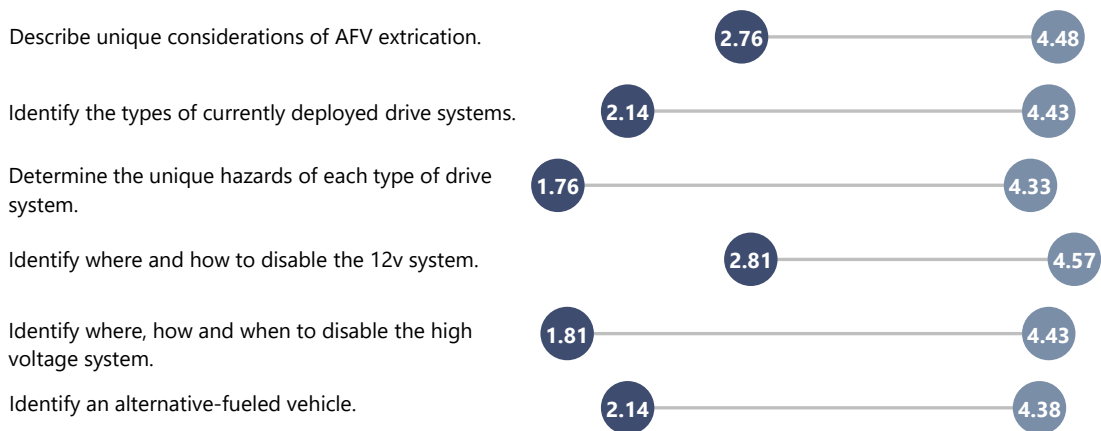
The Automotive Technology and Fire Science programs at Columbus State collaborated to host an Alternative Fuel Vehicle Extrication (AFVE) Workshop in August 2018. Participants had the option of choosing a Tuesday, August 14, or Wednesday, August 15 option to attend. Firefighters, police officers, and tow truck operators attended the hands-on event to learn about unique safety concerns associated with hybrid/electric, compressed natural gas, and hydrogen-powered vehicles. The workshop included presentations and guest speakers from Clean Fuels Ohio, the Center for Automotive Research at The Ohio State University, industry partners, and state agencies. The program featured operational hybrid vehicles that gave participants the opportunity to observe and practice extrication processes. At the end of the workshop, participants were asked to complete an evaluation survey that was designed to capture their perceptions regarding the effectiveness of the workshop to assess the extent to which the targeted learning objectives were met. Eleven individuals attended the Tuesday, August 14 workshop, and ten attended on Wednesday, August 15. All 21 participants completed the evaluation. A copy of the survey can be found in Appendix C. The following figures summarize the findings from this survey.

Every aspect of the workshop’s design and implementation was rated as either “Extremely effective” or “Very effective” by the majority of participants. Only the registration process received a few ratings of “Moderately effective” or “Only slightly effective.”



**Figure 3.** Response frequencies to the question, “Please rate the effectiveness of each aspect below.” (N=21)

Participants’ mean ratings of their awareness increased for each of the knowledge objectives targeted by the workshop.



**Figure 4.** Mean participant responses to the question, “For each item below indicate how you would have rated your level of understanding BEFORE the event and AFTER the event.” The response scale was from 1 to 5 with 1=Very low, 2=Low, 3=Medium, 4=High, 5=Very high. (N=21)



Participants were also asked to identify the one or two things that would have made the event more interesting or valuable for them. The most commonly mentioned improvement suggestion was to bring in a greater variety of alternative vehicle types, including larger vehicles buses and trucks. Some also suggested providing more hands-on learning opportunities. In response, the project team has designed the 2019 AFVE Workshop being held in August to include hybrid vehicle test drives and a wider variety of hybrid types including larger vehicles and a large hybrid truck that is being provided by the City of Columbus. The team has also managed to purchase three Toyota Prius scrap hybrids that will allow more participants to gain hands-on experience with the extrication process. A third workshop day is being added to increase availability to cover all fire department shifts.

The project team also took advantage of suggestions provided by the 2018 participants to better promote awareness of the event to a larger number and broader range of potential participants. For instance, the team has also expanded its promotional efforts for the 2019 event which started two months earlier than in prior year to allow for a second round of communication to ensure event capacity. Additional specific enhancements to promotional communications included the following: updating marketing materials with standardized branding for increased event recognition; posting on social media platforms including Twitter, Facebook, and Instagram; emailing current students enrolled in the Columbus State fire safety programs; providing brochures and flyers to regional fire chiefs for display at regional fire departments and the Columbus State Police Department; and verbal promotion at related professional meetings including the July 18 Municipal Equipment Maintenance Association (MEME). The impact of these efforts on recruitment for the 2019 AFVE Workshop will be included in the final report.

### **Purchasing of Equipment**

As noted in the Year 2 evaluation report, Columbus State has a partnership with Ford, as Ford provides the program with the technology to offer its credentialing program at the college. This partnership allows instructors and students in the Automotive Lab to utilize the same technology (i.e., Ford Factory Scan tool) that Ford dealership technicians use to service and diagnose vehicles. During Year 3, a compressed natural gas (CNG) tank was purchased and installed in the automotive lab at Columbus State for use in the AUTO-2391 course. The CNG tank will be utilized to provide students with hands-on experience in refilling alternative fuel vehicles, making it one of the few sites in central Ohio with that capacity. Other related projects, such as Fueling our Future, will be able to utilize the station as well for refilling CNG vehicles. The tank is awaiting fire marshal approval to be fully operational for the course.

Also, during the current grant year, the project team received a Hybrid Vehicle Systems Panel Trainer as a donation from the Delaware Area Career Center. The trainer provides students and instructors with the opportunity to demonstrate, investigate, and troubleshoot a simulated hybrid vehicle electrical system. The physical trainer comes with a virtual training simulator for electronic incorporation into the coursework. The project team also leveraged its membership in the National Alternative Fuels Training Consortium (NAFTC) to acquire a cutaway Prius and a running propane engine that is being used in the AUTO-2390 and 2391. With the trainer and cutaway Prius students will gain practical experience on the kinds of alternative fueled systems they will see on the job. Several additional equipment items were purchased for educational use in the new and revised courses including a high voltage battery tester.

### **Recruitment and Outreach Activities**

The project team continued to engage in recruitment and outreach activities in Year 3 through professional development sessions and the creation of promotional materials to raise awareness of the Alternative Energy Automotive Technician program and career opportunities in the automotive and alternative energy industries.

The team designed a flyer to recruit students and incumbent workers for AUTO 2190 which outlines the benefits of the course in preparing them for the future of the automotive industry. The marketing department at Columbus State created promotional materials specifically for the AUTO-2390 and AUTO-2391 courses and for the entire Automotive Technology program. With industry support, the Automotive Technology department also created a poster that highlights the automotive degrees and certifications offered at Columbus State, along with the unique benefits that Columbus State offers to students including its flexibility, affordability, and direct connections to industry. The poster is being displayed at local automotive employers to encourage their employees to pursue a degree or certification in Automotive Technology at Columbus State.

The project team also assisted with the conceptualization and implementation of an Ohio Environmental Education Fund (OEEF) grant awarded by the Ohio Environmental Protection Agency (OEPA) called Fueling our Futures: Introducing 7th Graders to Careers in Clean Energy. The project consisted of developing lesson plans on clean energy for 7th-grade science teachers and providing professional development courses to educators on how to incorporate the plans into their classrooms. During the professional development sessions, educators were provided with hands-on lab kits to assist with engaging their students on the green energy topics. The project team then organized middle school demonstrations on clean energy that featured a full-sized hydrogen fuel cell bus. Between two iterations of the event, one in Northeast Ohio and one in Central Ohio, 1287 7th grade students, 13 teachers involving 8 middle schools participated in the event.

In terms of direct recruitment, the City of Columbus sponsored a cohort of 13 city-employed auto technicians to take both the AUTO 2390 and 2391 courses to increase their knowledge and skills in working with alternative fuel vehicles. The project team will look to continue this partnership to provide Columbus City employees with opportunities for professional development while increasing recruitment for the alternative fuel courses and certificate.

**Evaluative Question #2: How has the pool of qualified students entering the automotive program expanded? To what extent was the pool expanded by students drawn from non-traditional backgrounds?**

Students enrolled in Automotive courses during the second term of 2019 completed a brief survey to assess whether they have obtained the knowledge and skills needed to pass their certification exams and whether they feel better prepared to succeed in an entry-level automotive technician position. Thirty-seven students, including 23 from the winter quarter and 14 from the spring quarter completed the survey. A copy of the complete survey can be found in Appendix D.

The first set of questions asked students to read statements related to their knowledge of the automotive technician role and their confidence in their abilities and then rate themselves based on what their agreement with the statement would have been before the course and now after the course.

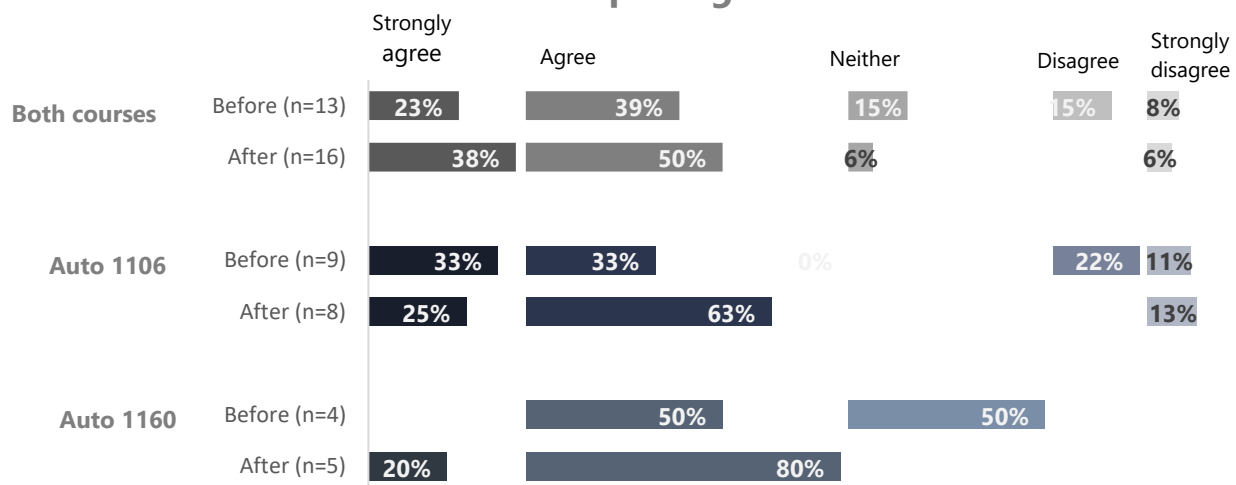
## Agreement ratings increased for each item across all courses except AUTO 2390 with the largest increases for students in AUTO 1106 and 1160.

	Course	n	Before	After	Change
I can succeed in an automotive entry-level position.	AUTO 1106	9	3.4	3.9	+ 0.5
	AUTO 1160	4	2.8	3.8	+ 1.0
	AUTO 2390	11	4.6	4.5	- 0.1
	AUTO 2391	8	4.6	4.6	-
I have a good understanding of the different tools and resources used in the automotive technology industry.	AUTO 1106	9	3.1	4.1	+ 1.0
	AUTO 1160	5	3.0	3.6	+ 0.6
	AUTO 2390	11	4.4	4.6	+ 0.2
	AUTO 2391	8	4.6	4.8	+ 0.2
I have sufficient knowledge to succeed in some aspects of an automotive technician role.	AUTO 1106	9	3.2	3.9	+ 0.7
	AUTO 1160	5	3.2	4.0	+ 0.8
	AUTO 2390	11	4.7	4.5	- 0.2
	AUTO 2391	8	4.6	4.6	-
I have the confidence to adapt to challenges that may arise in the field.	AUTO 1106	9	3.6	4.0	+ 0.4
	AUTO 1160	5	2.8	3.8	+ 1.0
	AUTO 2390	11	4.8	4.5	- 0.3
	AUTO 2391	8	4.5	4.6	+ 0.1

**Table 2.** Mean agreement ratings across all courses and per course in response for the question, "Respond to the following items by first by thinking of how much you agreed with the statement BEFORE taking this Automotive Technology course and then how much you agree with the statement AT THIS TIME."

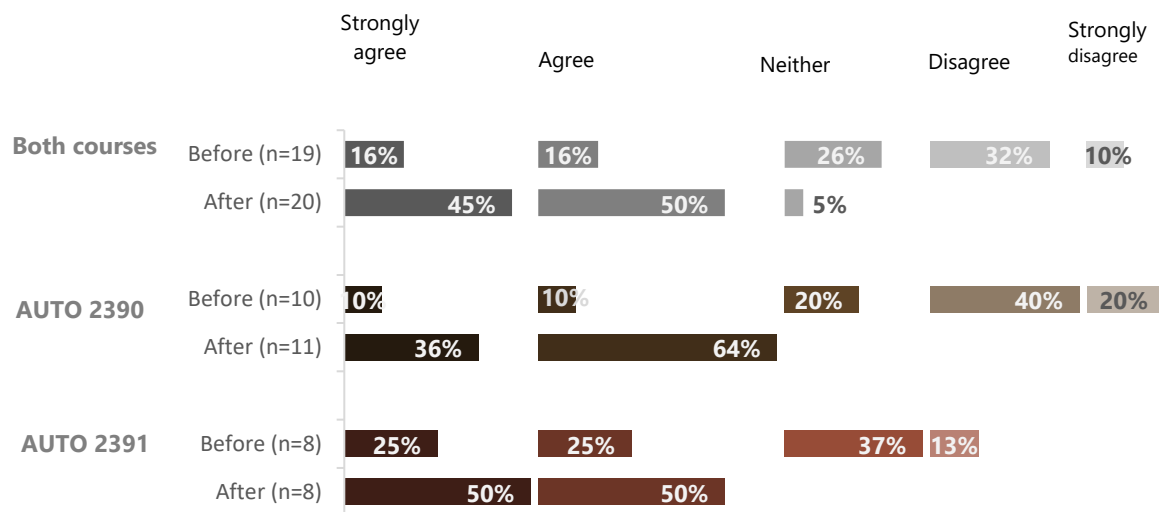
The next set of questions asked students questions relating to the extent to which the courses prepared them to pass their certification exams

## AUTO 1106 and 1160 students' confidence in doing well on their certification increased after completing the course.



**Figure 5.** Response frequencies for all respondents to the question, "I am confident I can do well on my certification." This question was only asked of students enrolled in AUTO 1106 and 1160.

## AUTO 2390 and 2391 students' confidence in passing the relevant portion of the ASE Certification Test increased after completing the course.



**Figure 6.** Response frequencies for all respondents to the question, “I am confident that I could pass the portion of the ASE Certification Test that is associated with this course.” This question was only asked of students enrolled in AUTO 2390 and 2391.

The average passage rate (defined as receiving a grade of C or above) for students enrolled in the modified automotive courses (i.e., AUTO 1106 and 1160) was 80.67% and the passage rate for students in the newly developed AUTO 2390 and 2391 courses was 100%. Eight of the students enrolled into these courses obtained an Automotive Technology AAS degree and three obtained an Automotive Technology Service Management AAS degree.

### Industry-recognized Certifications

One strategy for increasing the pool of qualified students is to increase the number of industry-recognized certifications obtained by students. In Year 3 of the project, 178 credentials were earned by students which was an increase of 39 from Year 2 (see Table 3). The overall passage rate for all attempted exams during Year 3 was 59% with an average overall test score of 72% and an average passing test score of 82% which were similar to rates from Year’s 1 and 2.

Credential Metric	Year 1	Year 2	Year 3
Student Attempts	25	225	303
Unique Student Attempts	13	109	195
Credentials Earned	14	139	178
Passage Rate	56%	62%	59%
Average Test Score – Overall	70%	74%	72%
Average Test Score – Passing	83%	83%	82%

**Table 3.** Overall student credential exam results by year.

The passage rate for the Verus Edge Lab Scope Operation & Data Management Certification was the highest among the certifications as it had been in Year 2, and the passage rate for the improved from 76% to 96%. In response to the relatively low passage rates in Year 2 for the Verus Edge Navigation & Scanner Operation Certification, the lead instructor modified his Engine Performance: Theory & Operation I to more directly target the knowledge required for the certification and effectively achieved his goal of improving success rates. Passage rates on the 596 Multimeter and ShopKey Pro Service & Repair remained somewhat low. It should be noted that, while the project team believes the acquisition of industry-recognized certifications is generally a good strategy for increasing a student's qualifications and employability their main goal is to ensure that students have the knowledge and skills they will need to succeed in their jobs. In the case of the 596 Multimeter Certification, the primary instructor for the relevant course (i.e., Electrical Systems: Theory & Operation I) has determined that the certification exam focuses too much on testing a student's ability to operate a particular piece of equipment rather than testing their knowledge and ability to apply it effectively in diagnosing and solving mechanical problem. Consequently, the instructor has opted to design the course to optimally achieve the latter instead of the former. It should also be noted that a lack of student motivation to succeed on these certification exams could be contributing to poor passage rates. Students are indeed required to take these certification exams as a portion of their course grades, but it is probably not significant enough to motivate most students to retake the exam when they don't pass.

	Passage rate			Student Attempts			Unique Student Attempts			Average Test Score – Overall			Average Test Score – Passing		
	Y1	Y2	Y3	Y1	Y2	Y3	Y1	Y2	Y3	Y1	Y2	Y3	Y1	Y2	Y3
Verus Edge Lab Score Operation & Data Management	60%	100%	97%	11	23	35	7	23	34	72%	89%	85%	85%	89%	86%
Verus Edge Navigation & Scanner Operation	53%	76%	96%	14	38	22	9	30	22	70%	77%	82%	81%	84%	84%
596 Multimeter	-	58%	63%	-	86	107	-	57	63	-	73%	72%	-	81%	80%
ShopKey Pro Service & Repair Information Level 1	-	46%	43%	-	78	112	-	50	61	-	68%	65%	-	81%	81%

**Table 4.** Credential-specific student exam results.

At the end of the spring 2019 term a Columbus State automotive student successfully earned the Alternative Fuels Technician certificate along with the Advanced Level Specialist, Maintenance and Light Repair Technician, and Master Automobile Technician certificates. Additionally, he successfully passed all twelve ASE certification exams. This individual was the first Columbus State automotive student to receive all four certificates and all twelve ASE certifications.

### Recruitment of Non-traditional Students

As a subset of the Automotive Program, the Alternative Energy project relies largely on the recruitment efforts of the overall department. For recruitment of underrepresented populations, the department works with other departments on Columbus State's campus and related initiatives for targeted recruitment. The project team is committed to recruiting underrepresented populations, including African American minority students from the inner city, U.S. Military Veterans, and female students. A unique method of recruitment is associated with each of these populations.

For recruitment of underrepresented African American minority students, the program leverages the Diversity Program Department at Columbus State, as it maintains that it is "committed to the recognition and value of the entire college community." Specific enrollment data for African Americans are not available; however, data related to

minority enrollment was obtained. According to university data (see Table #), during the 2018-19 academic year, 38% of students who enrolled in any of the Automotive courses at Columbus State were minorities. The percentage of minority students who have enrolled in an Automotive course has remained steady across the project's three years. These rates are on par with the percentage of minority students (41%) enrolled at Columbus State and higher than the percentage of minorities in the Columbus (Franklin County) area (34%; Ohio Development Services Agency, 2016).

The Veterans Affairs Office on the Columbus State campus is assisting with coordinating the recruitment of U.S. Military Veterans to the Automotive program. Looking at the 2018-2019 data, 10% of the students completing Automotive courses at Columbus State were veterans. While this rate has fluctuated somewhat over the three years, it remains consistent with the number of veterans in the Columbus area (Franklin County) at 6% (n=70,153)<sup>1</sup>.

To recruit underrepresented female students, Columbus State maintains their involvement in ODE's project "WE are STEM." The WE are STEM project is a statewide initiative to encourage female middle and high school students to consider information technology-related career fields and to support their transition to college. During the 2018-2019 academic year, 13% of the students who enrolled in an Automotive course were female. This was a slight increase from the 2017-2018 academic year and is consistent with the national percentage of women employed in the Automotive Repair & Maintenance which was 8.3% in 2016 (U.S. Department of Labor, 2016).

Non-traditional Student Representation			
	2016-17 (n=222)	2017-18 (n=132)	2018-19 (n=94)
Minority	85 (38%)	54 (41%)	36 (38%)
Veteran	17 (8%)	7 (5%)	9 (10%)
Female	19 (9%)	9 (7%)	12 (13%)

**Table 5.** Non-traditional student representation in Alternative Energy Automotive Technician program.

<sup>1</sup> This figure was obtained from the US Department of Veterans Affairs: [https://www.va.gov/vetdata/veteran\\_population.asp](https://www.va.gov/vetdata/veteran_population.asp)

### **Evaluative Question #3: To what extent is the model being disseminated regionally? How is the model being used by other entities?**

The project team made progress on their efforts to promote and disseminate the team's model. Mark Gerko, Engineering and Transportation Technology Chair at Columbus State, gave a presentation on Pathways to Alternative Energy Automotive Technicians, at the Midwest Green Fleets Conference on September 24, 2018. The presentation provided an overview of the Automotive Technology Program at Columbus State and highlighted the work being completed through the AUTO project. Mark gave an in-depth look at the Alternative Energy Automotive Technicians certificate and provided the rationale behind the courses that were modified and developed to increase student's knowledge of alternative energy topics across the program. The skills that students are learning in the courses were connected to automotive jobs and how the courses are preparing students for the next generation of automobiles.

Due to the success and recognition received from the Educator Bus Tour, a Summary and Planning guide was created for the event. The guide outlines the best practices for planning, implementing, and recruiting, and can be utilized by institutions to assist in the development of similar initiatives. The evaluation report for the Educator Bus Tour Survey Results also provides feedback on what was successful, and how the program could have been improved to best fit educator needs. These materials were disseminated at the 2018 Advanced Technological Education Principal Investigators (ATE) PI conference and the 2019 High Impact Technology Exchange (HI-TEC) conferences.

The project's PI, Steve Levin gave a presentation on Alternative Fuel Agnostic: An "All of the Above" Approach to AFV Training, at the NAFTC Conference that took place from October 30, 2018, to November 1, 2018. The presentation provided a comprehensive breakdown of the components of LPG, CNG, LNG, ANG, HHV, and H2FC/FCEV fueled vehicles, and how each one operates. The presentation also included an overview of the AUTO project and the Automotive Technology program at Columbus State.

An article on the Fueling our Futures program was published in The Alliance Review highlighting the project's visit to Alliance Middle School. The article outlines the purpose of the program and why the community should invest interest in renewable energy technologies. An additional article was published on Gas World outlining the project's innovative curriculum and approach to renewable energy education.

### **Evaluative Question #4: How satisfied are teachers and faculty with professional development activities? To what extent are teachers and faculty incorporating lessons learned from professional development activities into their classrooms?**

The project proposal had originally imagined a professional development workshop for high school instructors entitled, "The Alternative Energy Educator Workshop" to be held as an annual fall workshop to assist with understanding the emerging trends in alternative energy automotive technology education, review the Columbus State curriculum, examine recruiting tactics, learn best practices, and complete a survey of alternative energy automotive education. Due to resource issues and potential overlap in demand the team instead decided to take advantage of the annual Ohio Automotive Instructor Workshop that was held in conjunction with the National Institute for Automotive Service Excellence (ASE) and the Ohio Department of Education (ODE) on October 19, 2018 to automotive educators from Ohio area high schools, career centers, and community colleges.

The workshop provided instructors with knowledge and resources related to alternative energy automotive technology to incorporate into their curriculum and raise students' awareness of the many educational and career options that are available. It included an overview of Columbus State's Automotive curriculum, the sharing of instructional best practices, industry partner presentations highlighting the skills and job opportunities that are in demand, and the Smart Columbus Experience Center Tour. At the end of the workshop, participants were asked to complete a brief paper/pencil survey designed to assess their perceptions regarding the design of the workshop and the effectiveness of the individual sessions. See Appendix E for a copy of the full survey.

**A total of 38 individuals attended the workshop** representing various job titles, organizations, and geographic locations, as shown below.

Job title	Career and Technical Education Center	High School	Community College
Automotive Instructor or Teacher	16	4	1
Automotive Technology Instructor	4	1	
Automotive Collision Repair Instructor	2		
Automotive Mechanics Instructor	1		
Automotive Services Instructor	1		
Instructor	3		
Teacher		3	

**Table 6.** Organizations and job titles of attendees at the Alternative Energy Educator Workshop

**The 38 attendees came from 32 educational institutions throughout Ohio**

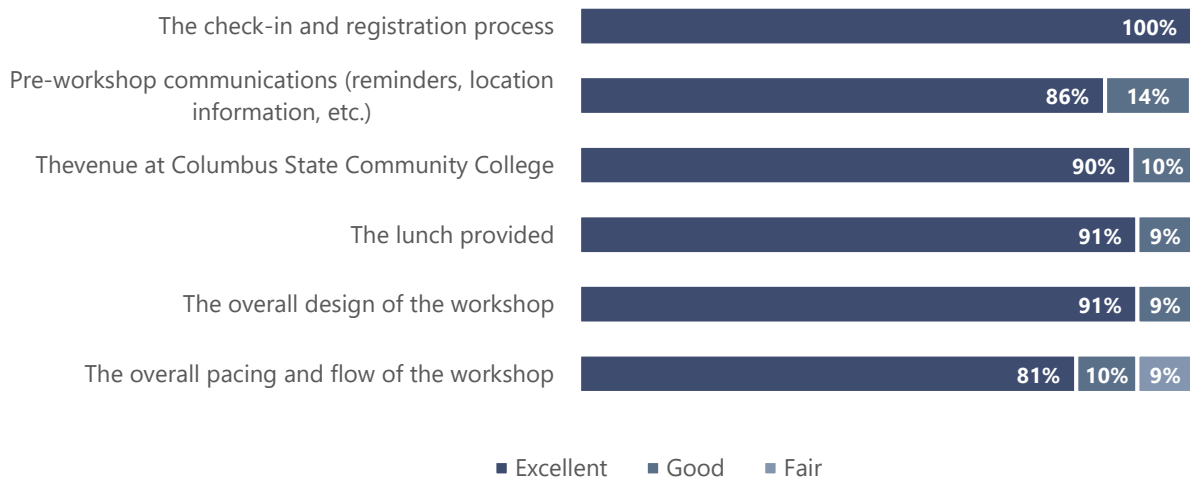


**Figure 7.** Geographic locations of the Alternative Energy Educator Workshop attendees.

Twenty-one of the 38 attendees (55%) completed the post-workshop survey.

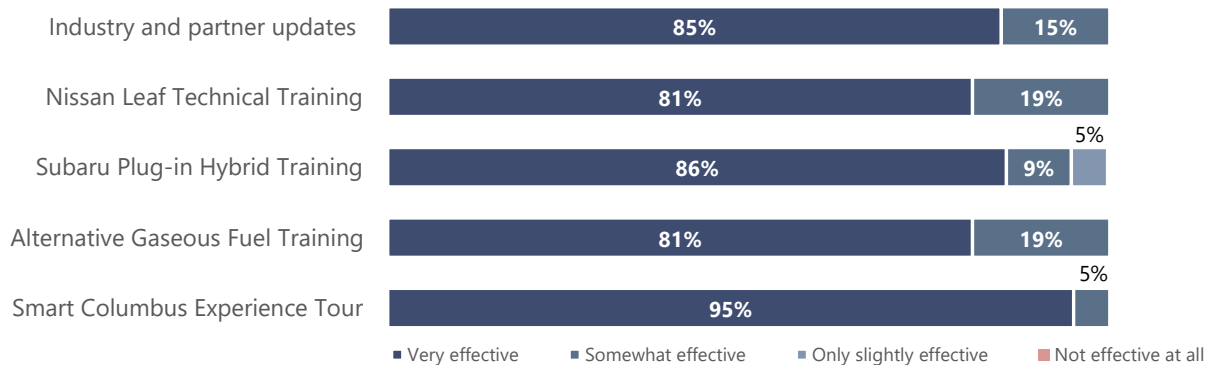


**Every aspect of the design and implementation was rated as “Excellent” by most participants.**



**Figure 8.** Response frequencies for all respondents to the question, “Please rate each of the following aspects related to the overall design and implementation today’s workshop.” (N=21)

**Each session was rated as “Very effective” by most participant**



**Figure 9.** Response frequencies for all respondents to the question, “Please rate how effective each of today’s sessions was for you.” (N=21)

The instructor’s workshop will be held again in October 2019. The project team is considering potential improvements based on feedback from the 2018 participants, including more time in the lab setting and a reduction in the amount of content covered.

**Evaluative Question #5: What is the project budget versus the actual expenditures? What is the estimated return on investment of the grant funds?**

Monitoring budgeted expenditures reveal that the project team is on track with the spending of the grant funds (see Table 7). The project team does have funds to allocate to planned equipment identified for both modified courses and newly developing courses.

Expenditures vs. Goal				
	Year 1	Year 2	Year 3	Total (% of budgeted)
Salaries + Benefits	\$ 56,835	\$57,896	\$97,642	\$212,373 (93%)
Equipment	\$ 58,615	\$33,216	\$77,559	\$169,389 (110%)
Travel	\$ 8,823	\$ 4,911	\$ 12,348	\$ 26,082 (121%)
Participant Support	--	--	\$ 5,000	\$ 5,000 (100%)
Other Direct Costs	\$ 18,205	\$36,150	\$ 40,967	\$ 95,321 (114%)
Direct Costs	\$142,478	\$132,173	\$ 231,016	\$505,666 (103%)
Indirect Costs	\$ 21,939	\$22,390	\$ 37,691	\$ 97,521 (107%)
<b>Total</b>	<b>\$164,649</b>	<b>\$92,616</b>	<b>\$134,495</b>	<b>\$587,687 (100%)</b>

**Table 7.** Automotive Budget Expenditures Compared to Projected Budget.

Discussion on the estimated return on investment of the grant funds will be more appropriate at a later stage in the project. Additional commentary regarding the budget will be tabled for the next iteration of the annual evaluation report.

**Evaluative Question #6: What were the significant unanticipated outcomes?**

The project team did not experience any significant unintended negative outcomes related to the project in Year 3. Most of the outcomes achieved during this year stemmed directly from the planning conducted by the project team. One of the team members, however, attended a grant-funded training and was given the opportunity to receive trainer certification for the Snap-On NC3 ProCut. None of the grant-related courses taught the content for this certificate but having an instructor who can teach this certification will be of value to current and future students and was an unintended positive outcome.

**Recommendations**

The project team achieved a significant number of accomplishments during Year 3. Three new courses focusing on the operation, diagnosis, and repair of alternate and hydrogen-fueled vehicles were developed and implemented. Most of the students who enrolled in courses associated with the project achieved a score of 80% or higher, and most students felt more confident in their ability to pass their certification tests than they had before taking the course. The team was successful in purchasing and acquiring new equipment that will allow students to get hands-on experience with the kind of equipment that they will see on the job. The project team also made good progress in their outreach efforts targeting younger students through their assistance with the development and implementation of the Ohio Environmental Protection Agency (OEPA) funded effort called Fueling our Futures. The project team successfully developed and implemented professional development opportunities including the Alternative Fuel Vehicle Extraction (AFVE) workshop for first responders and the Automotive Instructor’s Workshop which led to knowledge increases. Project team members continued to work with their Industry Leadership Team to

gain their perspective on project initiatives including recruitment strategies for increasing awareness among prospective students of the opportunities for good paying positions and careers in servicing alternative fueled vehicles. Faculty on the team joined several professional organizations in Year 3 such as the National Alternative Fuels Training Consortium which will help the team to establish more connections within the industry to stay current with the latest technologies and gain a better understanding of the knowledge and skills that are in demand.

The project team has obtained a six-month extension for this project in order to run another AFV workshop and educator workshop. We have a few recommendations for the team as they complete these efforts and close out the project at the end of 2019.

### **Certification passage rates**

Discussions with the project team regarding the potential reasons for low passage rates on the 596 Multimeter certification exam revealed that the instructor for the Electrical Systems: Theory and Operations 1 course felt that this certification was too narrowly focused on the operation of a single piece of equipment and chose to design the course to teach the broader range of knowledge and skills that students need for electrical system diagnosis and intervention. While students might not be as prepared as they could be for the 596 Multimeter certification exam, the instructor believes that his students will be more qualified in the area of electrical systems overall which is more consistent with the goals of this project. This kind of strategic decision process should be used for the other courses and related certifications to determine if the amount of content devoted to certification preparation is in the students' best interests.

A lack of student motivation to obtain certifications was identified as another possible factor in the lower passage rates. For certifications that would truly benefit students in terms of enhancing their qualifications and improving their employment opportunities, the team should find ways convey these benefits such as testimonials from program graduates or through class discussions with guest employers. Other, more immediate, incentives such as extra credit for passing certification exams might also be considered.

### **Recruitment and enrollment**

Enrollment rates in the automotive program have declined over the three years of the project even as the project team has engaged in multiple recruitment and outreach efforts. While the reasons for reduced enrollment might be due to factors outside the control of the program, the project team should work to identify new strategies for attracting students into the program. A good first step would be to gather specific information from enrolled Automotive students regarding how they heard about the program and what factors contributed most to their decision to enroll in the automotive technician program at Columbus State. These students are also likely to have valuable insights regarding the barriers or factors that prevent prospective students from pursuing educational or career opportunities in the automotive technician field.

Finally, we recommend that the project team remain in contact with students who graduate from the program. These individuals will be important sources of information regarding what the automotive program is doing well and what they could do better in terms of recruiting prospective students into the program and preparing them effectively for jobs in the alternative automotive technician field. In addition, successful graduates have the potential to become the most effective advocates for the automotive program and could provide the most valuable feedback for recommending changes to the program and should be invited to provide testimonials and even speak about the program at outreach events.

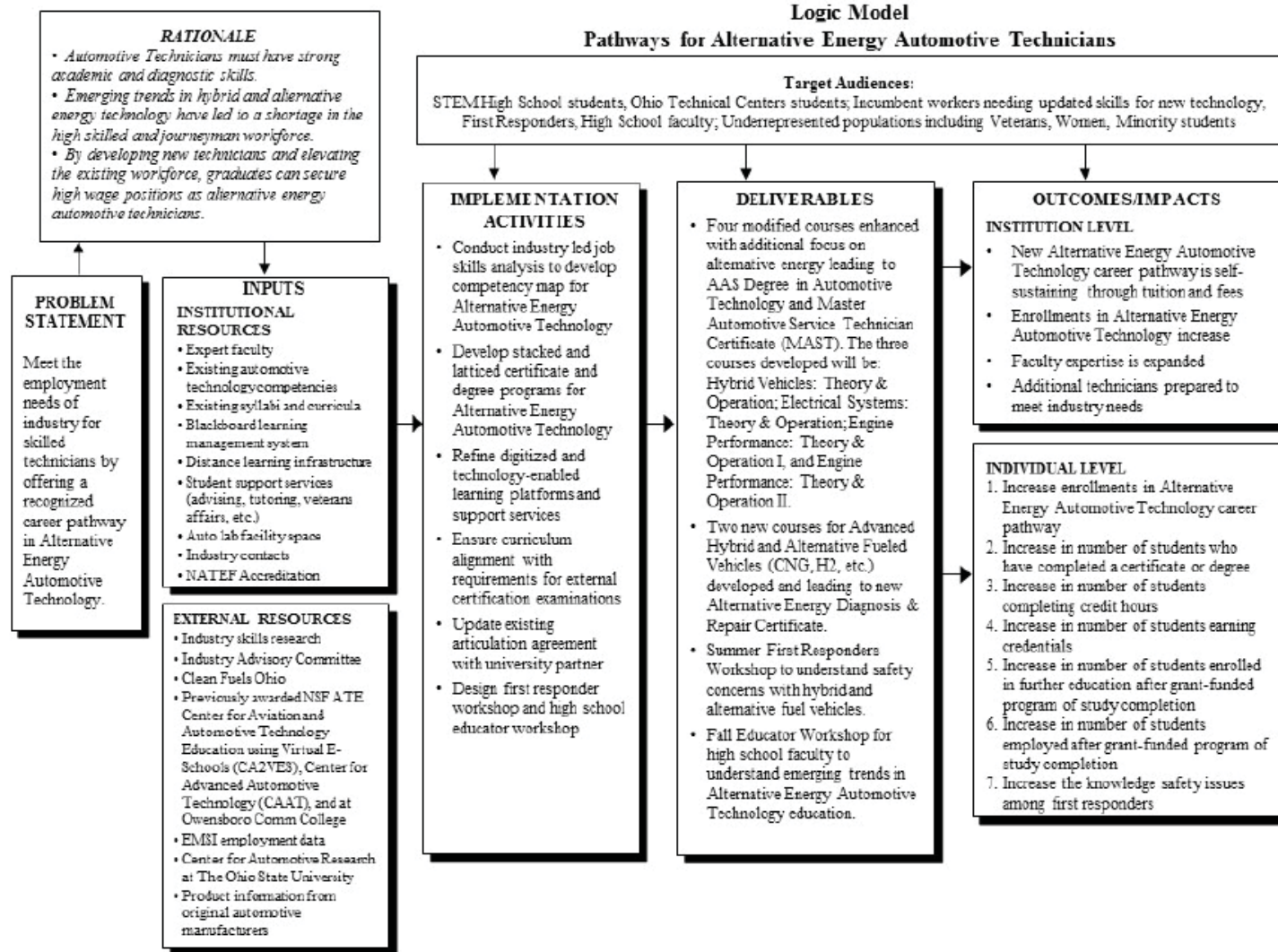
## References

McNellis, P. (2009). *The Compression Planning Advantage: A blueprint for resolving complex issues*. Create Space Independent Publishing Platform: Delaware.

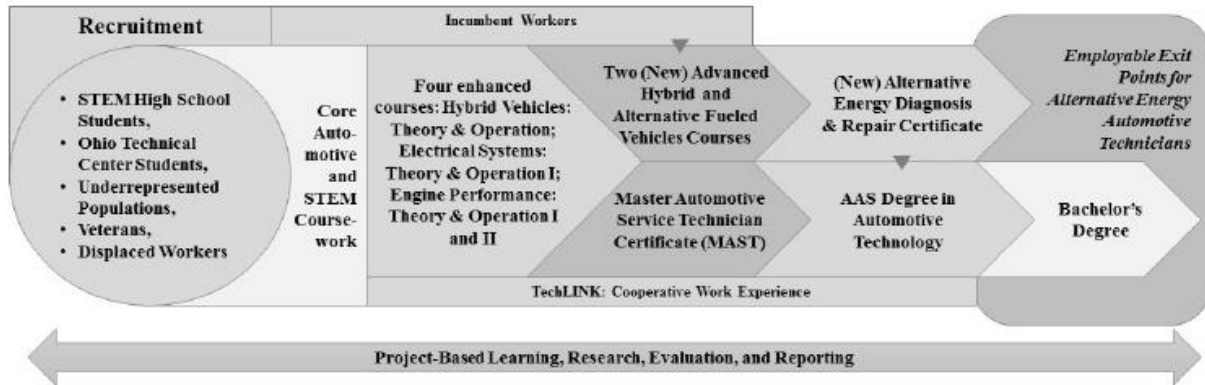
Ohio Development Services Agency, Office of Research (2016). Ohio County Profiles: Franklin County. [https://development.ohio.gov/reports/reports\\_countytrends\\_map.htm](https://development.ohio.gov/reports/reports_countytrends_map.htm).

U.S. Department of Labor, Bureau of Labor Statistics. (2016). Household data annual averages. <https://www.bls.gov/cps/cpsaat18.htm>.

# Appendix A – Pathways for Alternative Energy Automotive Technicians Logic Model



## Appendix B – Project Pathway



## Appendix C – AFVE Workshop Participant Survey

Please complete the survey below. Do not provide your name on the survey as all responses will be kept anonymous.

For each item below indicate how you would have rated your level of understanding BEFORE the event and AFTER the event.

Very Low	Low	Medium	High	Very High	←	BEFORE THE EVENT	AFTER THE EVENT	→	Very Low	Low	Medium	High	Very High
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Identify an alternative-fueled vehicle.			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Identify the types of currently deployed drive systems.			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Determine the unique hazards of each type of drive system.			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Identify where and how to disable the 12v system.			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Identify where, how and when to disable the high voltage system.			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Demonstrate unique considerations of AFV extrication.			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

What did you learn at the event that was most surprising to you? (Could be related to an item above or something else)

Please rate the effectiveness of each aspect below.	Not effective at all	Only slightly effective	Moderately effective	Very effective	Extremely effective	Can't rate
The registration process	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="radio"/>
Communication with you leading up to the event	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="radio"/>
The venue	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="radio"/>
The food provided	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="radio"/>
The overall design of the workshop	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="radio"/>
Overall pacing and flow of the workshop	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="radio"/>

Please rate the effectiveness of each session below.	Not effective at all	Only slightly effective	Moderately effective	Very effective	Extremely effective	Can't rate
Pre-work (4-hour NFPA module)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="radio"/>
Hybrid vehicles undercarriage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="radio"/>
Hybrid vehicles under hood	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="radio"/>
Hybrid vehicles battery compartment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="radio"/>
Honda CNG	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="radio"/>
Dodge Van CNG	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="radio"/>
Hydrogen generating station demonstration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="radio"/>
Vehicle extraction	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="radio"/>

What 1 or 2 things would have made the event more interesting or valuable for you?

What could we do to ensure more people hear about the event next year?

What could we do to ensure more people are able to attend the event next year?

# Appendix D – Automotive Course Feedback

Columbus State Community College (CSCC) was awarded a grant from the National Science Foundation to modify courses in Automotive Technology. Project planners are interested in finding out information that will help make that program as effective as possible. The questionnaire will take about 3-5 minutes to complete. Your participation is completely voluntary. All responses will be kept strictly anonymous, and individual responses will not be shared. Please read each question carefully and respond candidly.

Indicate the course for which you are completing this survey.

- AUTO 1106 - Auto Shop Orientation and Service
- AUTO 1160 - Electrical Systems: Theory & Operation I
- AUTO 1180 - Engine Performance: Theory & Operation I
- AUTO 2280 - Engine Performance: Theory & Operation II
- AUTO 2390 - Advanced Hybrid Vehicles
- AUTO 2391 - Advanced Alternative Fueled Vehicles

Please indicate how many Automotive Technology courses you have taken prior to this term.

- 1
- 2
- Three or more

The next few questions ask about this specific course.

Respond to the following items by first by thinking of how much you agree with the statement BEFORE taking this Automotive Technology course and then how much you agree with the statement AT THIS TIME

BEFORE THIS COURSE					AFTER THIS COURSE					
Strongly agree	Agree	Neither	Disagree	Strongly disagree		Strongly agree	Agree	Neither	Disagree	Strongly disagree
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	I can succeed in an automotive entry level position.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	I have a good understanding of the different tools and resources used in the automotive technology industry.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	I have sufficient knowledge to succeed in some aspects of an automotive technician role.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	I have the confidence to adapt to challenges that may arise in the field.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

What, if anything, was particularly helpful about this course in terms of preparing you for an entry-level position in Automotive Technology?

What - if anything - would you change about this course to make it more helpful?



**If you are completing this for AUTO 1106, 1160, 1180, or 2280, please answer questions 2.1, 2.2, and 2.3.**

**2.1 Please indicate any certifications you are preparing for – or have completed - during this term.** (If none, then leave blank and turn in your completed survey. Thanks!)

Preparing for	Completed	
<input type="checkbox"/>	<input type="checkbox"/>	596 Multimeter Certification
<input type="checkbox"/>	<input type="checkbox"/>	Verus Edge Navigation & Scanner Operation Certification
<input type="checkbox"/>	<input type="checkbox"/>	ShopKey Pro Service & Repair Information Level I Certification
<input type="checkbox"/>	<input type="checkbox"/>	Verus Edge Lab Scope Operation & Data Management Certification

**2.2 Respond to the following items by first by thinking of how much you would have agreed with the statement BEFORE taking this course and then how much you agree with the statement AT THIS TIME.**

<i>BEFORE TAKING THIS COURSE</i>						<i>AFTER TAKING THIS COURSE</i>					
Strongly agree	Agree	Neither	Disagree	Strongly disagree		Strongly agree	Agree	Neither	Disagree	Strongly disagree	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	←		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	→
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	I am confident I have the ability to learn the material for my certification.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	I am confident I can do well on my certification.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	

**2.3 What - if anything - would you change about this course to help you feel better prepared to do well on your certification.**

**If you are completing this for AUTO 2390 or 2391, please answer questions 3.1 and 3.2**

**3.1 Respond to the following items by first by thinking of how much you would have agreed with the statement BEFORE taking this course and then how much you agree with the statement AT THIS TIME.**

<i>BEFORE TAKING THIS COURSE</i>						<i>AFTER TAKING THIS COURSE</i>					
Strongly agree	Agree	Neither	Disagree	Strongly disagree		Strongly agree	Agree	Neither	Disagree	Strongly disagree	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	←		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	→
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	I am confident that I could pass the portion of the ASE Certification Exam that is associated with this course.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	This course has prepared me well for the portion of the ASE Certification Exam that is associated with this course.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	

**3.2 What - if anything - would you change about this course to help you feel better prepared for the ASE Certification Exam?**

Please rate each of the following aspects related to the overall design and implementation today's workshop.

	Poor	Fair	Good	Excellent
The check-in and registration process	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pre-workshop communications (reminders, location information, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The venue at Columbus State Community College	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The lunch provided	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The overall design of the workshop	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The overall pacing and flow of the workshop	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

What 1 or 2 changes - if any - do you recommend for improving the workshop's design or implementation?

Please rate how effective each of today's sessions was for you.

	Not effective at all	Only slightly effective	Somewhat effective	Very effective
Industry and partner updates ( <i>SkillsUSA. ASE Education Foundation</i> )	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nissan Leaf Technical Training	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Subaru Plug-in Hybrid Training	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Alternative Gaseous Fuel Training	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Smart Columbus Experience Tour	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

What 1 or 2 changes - if any - do you recommend for improving any or all sessions from today?

What are the 1 or 2 MOST useful things that you learned during today's workshop?

**Thank you!**

## Appendix E – Automotive Instructor’s Workshop

Please rate each of the following aspects related to the overall design and implementation today’s workshop.

	Poor	Fair	Good	Excellent
The check-in and registration process	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pre-workshop communications (reminders, location information, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The venue at Columbus State Community College	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The lunch provided	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The overall design of the workshop	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The overall pacing and flow of the workshop	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

What 1 or 2 changes - if any - do you recommend for improving the workshop’s design or implementation?

Please rate how effective each of today’s sessions was for you.

	Not effective at all	Only slightly effective	Somewhat effective	Very effective
Industry and partner updates ( <i>SkillsUSA. ASE Education Foundation</i> )	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nissan Leaf Technical Training	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Subaru Plug-in Hybrid Training	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Alternative Gaseous Fuel Training	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Smart Columbus Experience Tour	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

What 1 or 2 changes - if any - do you recommend for improving any or all sessions from today?

What are the 1 or 2 MOST useful things that you learned during today's workshop?

**Thank you!**