CALIFORNIA ENERGY COMMISSION

CALIFORNIA NATURAL RESOURCES AGENCY

California Energy Commission

Clean Transportation Program

**FINAL PROJECT REPORT**

# Zero-Emissions Vehicle High School Pilot Project

**Prepared for: California Energy Commission**

**Prepared by: The Advanced Transportation and Logistics Initiative (ATL), Cerritos Community College District**

atl
Advanced Transportation and Logistics

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# California Energy Commission

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# PREFACE

Assembly Bill (AB) 118 (Núñez, Chapter 750, Statutes of 2007) created the Clean Transportation Program. The statute authorizes the CEC to develop and deploy alternative and renewable fuels and advanced transportation technologies to help attain the state's climate change and clean air goals. Assembly Bill 126 (Reyes, Chapter 319, Statutes of 2023) reauthorized the funding program through July 1, 2035, and focused the program on zero-emission transportation. The Clean Transportation Program has an annual budget of about $100 million and provides financial support for projects that:

- Develop and deploy zero-emission technology and fuels in the marketplace where feasible and near-zero-emission technology and fuels elsewhere.
- Produce alternative and renewable low-carbon fuels in California.
- Deploy zero-emission fuel infrastructure, fueling stations, and equipment where feasible and near-zero-emission fuel infrastructure, fueling stations, and equipment elsewhere.
- Establish workforce training programs and conduct public outreach on the benefits of alternative transportation fuels and vehicle technologies.

To be eligible for funding under the Clean Transportation Program, a project must be consistent with the CEC's annual Clean Transportation Program Investment Plan Update. The CEC executed Contract 600-16-005 on October 25, 2017, to develop and implement a pilot training program for high school students to increase awareness of careers in the field of clean transportation.

# ABSTRACT

The ZEV High School Pilot Project for the California Energy Commission sought to develop and implement a training program for high school students to increase their awareness of careers in clean transportation.

A focus of the project was to fund high schools in disadvantaged and low-income communities across the state. Applicants were asked if they were a primarily rural-serving or minority-serving institution as part of the high school application package. The contractor also obtained applicant schools reported free and reduced-price meals data.

Under the $3.5 million agreement, the contractor, in partnership with the California Energy Commission, approved 51 programs at 50 high schools in disadvantaged communities to participate in the pilot. As a result, zero-emission vehicle (ZEV) curriculum and hands-on projects, including the necessary tools and supplies, were added to automotive or other programs at each participating school. These courses introduce ZEV technical training to more than 3,750 students at a time and will continue to do so in the coming years.

About $55,000 of the agreement was provided for faculty training. Sixty-two instructors from participating high schools and their community college partners received hands-on training to learn how to build an electric vehicle including electric vehicle component training, basic electricity, wiring and mechanics.

As a result of the completed work, 70 percent of students surveyed indicated they would consider a career in clean fuel transportation because of taking the updated ZEV class, and 86 percent would recommend the class to others interested in the field. Because of the project implementation, additional post-high-school pathways were established between funded schools and local community colleges and schools have benefitted from strengthened relationships with industry, enhanced recruitment efforts, increased enrollment, and expanded campus support and involvement.

**Keywords**: Zero-emission vehicles, clean fuels, technical training, curriculum, hands-on, partnership

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# EXECUTIVE SUMMARY

This project sought to develop and implement a pilot training program for high school students to increase their awareness of careers in the field of clean transportation. This is the final report for California Energy Commission (CEC) Contract 600-16-005. The final report summarizes all activities conducted by the Advanced Transportation and Logistics (ATL) Sector at Cerritos Community College District (contractor). Based on the approved Task 2 – Clean Fuels Transportation Pilot Career Opportunity Training Plan, the contractor implemented Task 3 of the contract. All high school subcontract activities were completed, including equipment purchases, curriculum implementation, and instructor professional development. High schools awarded funding are identified in Table 1: High Schools Awarded Funding.

## Equipment and Supply Purchases

The Switch Lab Electric Vehicle Kit (https://theswitchlab.com/ev-kits-and-curriculum/) was purchased by 49 of the 50 funded high schools and includes 72 volt direct current (DC) lead acid batteries, unpainted chassis, all required wiring, two seats, lights, seat belts, and windscreen. This kit was designed to be assembled and easily disassembled so that students can use it year after year. Schools also purchased tools necessary to complete the electric vehicle (EV) build, including electrical glove kits, insulated tools, safety hooks.

Funding was also used by three schools to purchase used EVs or hybrids to work on in their auto shops. One school purchased a dual port EV charging station including installation.

In lieu of the Switch Lab EV Kit, Schurr High School purchased tools and supplies used to assemble a Shell Eco-marathon (https://www.shellecomarathon.com/about.html) competition vehicle.

Funded schools purchased curriculum materials from The Switch Lab (https://theswitchlab.com/ev-kits-and-curriculum/), along with their EV project kits. Materials included textbooks, class lectures, homework assignments, class research assignments, lab kits, and a curriculum club membership.

The EV kit vendor trained 62 instructors, including community college faculty, to learn how to build the Switch EV. The training included components training, basic electricity, wiring and mechanics. Each of the 21 workshops held was four and a half days in length, with morning lectures followed by hands-on building and lab projects in the afternoons.

The Switch EV kit and curriculum was implemented in existing automotive and other related career and technical education (CTE) programs on funded high school campuses. Courses that include new ZEV curriculum through CEC funding will affect an estimated 3,750 students each year.

## Student Feedback

A post-class survey (Appendix A: Student Exit Survey Results) as offered to students who participated in the Zero-Emissions Vehicle High School Pilot Project. There were 519 students who submitted responses to the survey questions. Results revealed that about 70 percent of respondents would consider a career in clean fuel transportation as a result of taking the class. Eighty-six percent would recommend the class to others interested in the field. Students also reported what they found most valuable about the class and how the class could be improved.

While matriculation agreements already exist between many high school automotive programs and associated local community colleges, there were new agreements established as a result of this project, which will directly benefit students who wish to continue their education in this area.

The most common response by instructors when asked to share a student success story was that their students had a desire to continue their education in clean transportation with the goal of working in this field. Instructors reported some of their students are enrolling in community college or other trade schools to learn more, interning for local businesses, or have obtained paid work in the field or a combination.

Because of the project implementation, campuses have benefitted from strengthened relationships with industry, enhanced recruitment efforts, increased enrollment, and expanded campus support and involvement.

## High School Award Presentations

Contractor and CEC representatives visited 21 funded schools during which each school was presented with an award plaque for its participation in this project, as shown in Figure ES-1. Plaques were shipped to the schools that did not receive in-person visits.

**Figure ES-1: Plaque Picture**

Source: Cerritos Community College

# CHAPTER 1:
# Contract Requirements

## Background/Problem Statement

The market for clean fuel and advanced vehicle transportation is creating new workforce career opportunities in California. To increase interest in this emerging field, it is essential that high school students view zero-emission vehicle (ZEV) automotive technologies as a viable career pathway. The clean fuel and advanced vehicle transportation space offers strong economic opportunities and benefits through high-tech advancements in the transportation field. Many high school students have not considered clean transportation as a career pathway because many K-12 automotive programs traditionally rely on older technologies limited by aging mechanical practices.

A focus of the project was to fund high schools in disadvantaged and low-income communities across the state. Applicants were asked if they were a primarily rural-serving or minority serving institution as part of the high school application package. The contractor also obtained applicant schools' reported free and reduced-price meals data.

## The Advanced Transportation and Logistics Sector

The Advanced Transportation and Energy (ATTE) Center, hosted by Cerritos Community College District, is a program that was created through initiative funding from the California Community Colleges Chancellor's Office. With additional Chancellor's Office funding, the statewide Advanced Transportation and Logistics Sector (ATL) was formed to implement statewide projects and growth in these industry areas. ATL was also hosted by Cerritos Community College District, in conjunction with the ATTE Center.

## Goal of the Contract

The goal of this contract was to offer advanced vehicle technology training to increase high school students' awareness of the growing ZEV market, introduce opportunities to students who may not have considered the clean transportation industry for a career, and offer the potential to matriculate into community college degree programs. The college district, in partnership with the California Department of Education (CDE) CTE Division and the California Energy Commission (CEC), invited high schools to participate in the pilot program. To the extent possible, the contractor focused on the participation of high schools that serve primarily underserved and disadvantaged communities.

## Objective of the Agreement

The agreement objective was to develop and implement a pilot training program for high school students to increase their awareness of careers in clean transportation.

# CHAPTER 2:
# Scope of Work Technical Tasks

## Task 2 – Training Plan

In this task, the district developed a draft, then final, pilot career project plan for creating career interest in clean fuel transportation careers among high school students. The need for an engaging, hands-on project with curriculum was central developing the training plan. While there were relatively few vendors in this space, the district searched for the most robust curriculum with pricing that fit within the budget allocated for equipment purchases.

Once the vendor was selected, the district developed an application for invited high schools, outlining the requirements and qualifications to receive funding. The district obtained a list of Title 1 high schools in California and invited high schools in each region of the state to submit an application. Selection to apply was also based on the size of the schools' automotive programs per CDE data obtained. Under the $3.5 million agreement, the district approved 51 programs at 50 high schools to participate in this project. Subcontracts with each of the high schools were implemented according to the overall requirements of the CEC contract.

The training plan included funds to train faculty from participating high schools and their community college partners to learn how to implement the project in their classrooms. The equipment and curriculum vendor, Switch Vehicles, provided this training. Funding was also used to provide additional professional development to high school automotive instructors by attending Mobilize Summit in October 2023.

Funding was also used to provide ASE seat licenses for an additional high school.

## Task 3 – Implementation of Approved Training Plan

This task sought implement the approved training plan. The district implemented and administered approved training plan, including:

1. Identifying high schools with robust automotive programs serving disadvantaged communities.
2. Subcontracting with approved high schools.
3. Arranging for instructor training through Switch Vehicle.
4. Providing information in progress reports on the operation and oversight of approve training plan, including:
    a. Activities related to monitoring the program.
    b. Challenges in program implementation.
    c. Proposed solutions to challenges related to program implementation.
    d. Information the Contractor deemed essential to the program's success.

A total of $2,877,012.52 was awarded to 50 high schools as part of this project.

**SWITCH EV Kit purchased for Mira Mesa High School.**

Source: Mira Mesa High School

## Faculty Trained

During the project period, 21 faculty training workshops were held. Locations were in Northern and Southern California to accommodate instructor travel. The four-and-a-half day workshop taught instructors how to build the Switch EV, including component training, basic electricity, wiring and mechanics. Morning lectures were followed by hands-on building and lab projects in the afternoons. A total of 62 instructors were trained.

- 56 high school instructors
- Six community college instructors from five partner schools
    - Fresno City College
    - Victor Valley College
    - American River College
    - Columbia College
    - Cerritos College

Instructors reported that the training was beneficial and provided needed skills so that they could effectively implement the Switch curriculum in their classrooms.

> "The instructor training was essential. The experience of putting a vehicle together during the training prepares you for any hiccups that may (will) be encountered while supervising students during the Switch vehicle build." — Octavio Armas, automotive instructor at Chaffey High School.

> "The Switch training gave me the skills I needed to set up workgroups and scheduling so that I could create appropriate workflow expectations and assessments. I got to see methods and tools more experienced teachers had used and developed to complete the

tricky aspects of this project." — David Rowcliffe, automotive instructor at Montclair High School.

**Figure 7: Faculty Training at Switch Lab Headquarters**

Source: Cerritos Community College

High school automotive faculty were also invited to attend [Mobilize Summit](https://www.mobilizesummit.com/) (https://www.mobilizesummit.com/) in October 2023. Project funds were used to provide tickets for 17 high school instructors. Summit topics included EV charging, Vehicle-to-Home Discharging, Generative AI for Automotive, and more.

## Student Effects

The Switch EV kit and curriculum was implemented in existing automotive and other related CTE programs on funded high school campuses. Course names include the following:

- Advanced Automotive Technology
- Advanced Auto Repair
- ASE Auto Tech I & II
- Automotive Diagnostic, Service & Repair
- Automotive Engineering
- Automotive Maintenance Light Repair
- Automotive Performance & Customization
- Automotive Technologies I & II
- Electrical Vehicles – Automotive Services
- Engine Technology
- Foundations of Transportation Technology
- Green Up and Go
- Introduction to Automotive Electrical
- Maintenance and Light Repair II and Maintenance and Light Repair III
- Manufacturing
- Physics
- ROP Electrical Systems
- ROP Preventative Maintenance
- Small Engine Repair
- Welding

Courses that include new ZEV curriculum through CEC funding will affect an estimated 3,750 students each year. The breakdown by school is as follows:

**Table 2: Zero-Emission Vehicle Course Enrollment at Participating Schools**

| High School | # Students (per year) |
|---|---|
| Adelanto High School | 54 |
| Alhambra High School | 60 |
| Artesia High School | 144 |
| Bret Harte Union High School | 22 |
| Buena Park High School | 50 |
| Calaveras High School | 41 |
| Calexico High School | 150 |
| California High School | 18 |
| Chaffey High School | 135 |
| Clovis West High School | 40 |
| Davis High School | 88 |
| Desert Mirage High School | 45 |
| Downey High School | 180 |
| Duncan Polytechnical High | 132 |
| Elsinore High School | 70 |
| Escondido High School | 30 |
| Etiwanda High School | 40 |
| Fallbrook Union High School | 40 |
| Fremont High School | 38 |
| George Washington High School | 15 |
| Hesperia High School | 50 |
| John A. Rowland High School | 60 |
| Katella High School | 25 |
| Kearny High School | 30 |
| Kern County/Redwood High School | 30 |
| La Habra High School | 11 |

| High School | # Students (per year) |
|---|---|
| Loara High School | 25 |
| Mark Keppel High School | 240 |
| Mira Mesa High School | 72 |
| Mission Valley ROP | 70 |
| Montclair High School | 60 |
| New Technology High School | 95 |
| Nogales High School | 10 |
| Oak Hills High School | 46 |
| Orange Glen High School | 20 |
| Pittsburg High School | 56 |
| Poway High School | 60 |
| Redwood High School | 38 |
| Rosamond High School | 80 |
| Santa Ynez High School | 56 |
| Savanna High School | 25 |
| Schurr High School | 228 |
| Seaside High School | 24 |
| Silicon Valley CTE | 66 |
| Sultana High School | 25 |
| Sunny Hills High School | 36 |
| Valley High School | 48 |
| Victor Valley High School | 192 |
| Vintage High School | 490 |
| Wilcox High School | 90 |
| **Total:** | 3,750 |

Source: Cerritos Community College

## Student Feedback

A post-class student survey was offered to students who participated in the ZEV High School Pilot Project. Results from the student survey can be found in Appendix A. There were 519 students who submitted responses to the survey questions. Results revealed that about 70 percent of respondents would consider a career in clean fuel transportation as a result of taking the class, and 86 percent would recommend the class to others interested in the field. When asked what students found most valuable about the class 388 students responded hands-on experience, followed by working with a team or group (344 students).

Suggestions for improving the class included:

- Providing hardcopy and video instructions.
- Spending more time on the hands-on aspects of the project.
- Having additional EVs to work on.
- Switching the groups over the course of the class.

Unfortunately, there were also some students in the class who were not necessarily interested in the project, which affects the students who take the project seriously, as noted in some student responses.

Many students expressed positive feedback about the project, rather than ways it could be improved. Here are a few examples:

> "I learned a lot about wiring and how electric vehicles work. It was cool to build a car from the ground up, and it allowed me to bond with other students. I had a lot of fun building the car and overcoming challenges that came up. It was a unique experience that many schools never get to experience." — Baudelio Villalobos, Automotive Instructor
>
> "So far it's been really great. Everyone is able to contribute their part and help the whole build move forward and all and all its been very fun." — Anonymous
>
> "I think the class is good as is especially since this is my first year in auto-tech." — Anonymous
>
> "I feel like this class was perfect. Nothing needs to be changed. This class was really fun, and I learned a lot this year." — Anonymous

Additional student feedback and testimonials can be viewed on the site visit videos posted on the ATL website (https://atleducation.org/category/cec/cecvideos/high-school-pcop-videos/).

Two schools also created their own videos with faculty and student testimonials as follows:

- Clovis West High School (https://vimeo.com/335475338)
- Etiwanda High School/Baldy View ROP (https://www.canva.com/design/DAFak0pZ2qE/rovR3iIgj9ECVrhTd24JZw/watch?utm_content=DAFak0pZ2qE&utm_campaign=designshare&utm_medium=link&utm_source=publishsharelink)

## Post-High School Pathways

While matriculation agreements already exist between many high school automotive programs and their local community colleges, there were new agreements established as a result of this project.

Silicon Valley CTE reported that a dual enrollment agreement was created with Evergreen Valley College to include AUTO117 Automotive Principles, as well as the school's current and future EV courses. Redwood High School in Kern County was able to establish an internship agreement with Bakersfield College to place automotive students at the facility. Because of this project, discussions were initiated with the Bakersfield College automotive program, which led to the college offering dual and concurrently enrolled classes and certificate programs.

Pathways were also established between Artesia High School and the Cerritos College Automotive and Advanced Transportation program, to include dual enrollment. Artesia High School reported also working on a similar arrangement with Long Beach City College.

## Student Successes

The most common response by instructors when asked to share a student success story was that their students had a desire to continue their education in clean transportation with the goal of working in this field.

At Redwood High School in Kern County, Chance E. became very interested in understanding all of the electrical components being discussed and was curious for more information about how relays work. The instructor was able to provide additional one-on-one mentoring to answer some of his questions. This student became even more engaged after watching a day-in-the-life video on Pathful Explore showing what it would be like to be an EV mechanic and the potential salary associated with that position. At the end of class, he approached the teachers and said, "That's it! I now know what my future career path is going to be."

Lucas Guimaraes from Downey High School has elected to work in the automotive trades. He worked to achieve professional competency in many areas, resulting in his enlistment to the U.S. Army, where he will serve as a technician.

One of Poway High School's students will be starting an internship with the local Ford dealer working on hybrids during the next school year because of the success of Poway's program.

> "Johnny Henry started the year very much on the quiet side. He would rather sit and listen to the guys talk about their diesel trucks than participate in the conversation. During the process of building the EV, it became very apparent that Johnny understood the vehicle probably better than I did. I took him aside one day to ask him about this. He told me that he found it very interesting and loved the fact that it was helping the environment. Johnny took the initiative at home and began researching Electric Vehicles and their components. It wasn't very long after that I assigned him as the project leader where he continued to shine. Johnny has plans to continue his education at a nearby trade school and is working at a local golf course maintaining their electric golf carts, so that he can continue his exposure to electric vehicles." — Ken Sooter, automotive instructor, Bret Harte High School

Students at Clovis West High School have been able to intern at local dealerships and repair shops and obtain paid jobs there upon graduation. Many students have continued on to Fresno City College, Universal Technical Institute, and the military to continue their training.

> "On the whole, students realized the importance of EV and that we are in an age of transition away from the combustion engine. Four students who loved off-road racing and rallies and were upset to know we were going to be learning about EV technology, including building an EV, had an awakening. All four, as they moved through the curriculum and build, slowly built a respect and then a passion for EVs. All four left the program seeking a trade school which offered EV training." — Keith Fisher, automotive instructor, Calexico High School

> "The student I would like to mention is Jesus Gomez. He was first introduced to the project his senior year and enjoyed working through the curriculum as the year progressed. Prior to this project, he had some exposure to electrical work and battery diagnostics. Jesus showed me that his knowledge towards future technology had greatly improved after a few weeks of working on the project and new curriculum. He is currently enrolled at Citrus College and studying to become a Toyota technician." — Ed Martin, automotive instructor, Rowland High School

Because of the ZEV course, a student at Katella High School wants to continue in the automotive industry and will be taking the ASE test to start his career.

Inspired by the EV build, some students undertook additional projects related to what they learned.

> "A couple of my students decided to enter the Solar Car Competition where they had to design, build, and race a solar car. Both students did extremely well due to having experience in building the electric vehicle." — Carlos Sanchez, automotive instructor, Savanna High School

> "All students who completed the Advanced Auto Technology capstone course which integrated Electric Vehicle technology successfully presented an EV showcase to the first- and second-year students on the campus." — Kathi Kent, CTE director, La Habra High School

Finally, there were important life lessons learned through working on the EV build.

> "When the build was nearing completion, and the students were testing the systems, there were many opportunities to learn from our mistakes. One of the students threw his hands up in frustration and wanted to quit. "This is HARD!" was his complaint. I took him aside and explained that "it's the 'hard' that makes it worth the effort." We had some lunch and then got back to work trying to find the mistake. HE was the one who discovered the loose electrical connector and tightened it up. The system worked perfectly, and he was beaming. A few days later, when we drove the car for the first time, he was thrilled that I allowed him to actually drive it in the parking lot. I made it a point to tell him that if he had quit, he wouldn't be sitting there in the driver's seat right then. He told me that I was right. It IS the 'hard' that makes it worthwhile." — Ken Cox, automotive instructor, Redwood High School

> "Although I cannot pinpoint just one major success story, I have a bunch of little ones. From some students learning how to use equipment, students taking leadership roles in

the class to get work done, students learning how to work together, language development, light bulb moments in learning, and many other things my students have experienced. In the end, the biggest takeaway is students leaving my physics class will have a project in school they completed and will always remember for the rest of their lives. That alone has and will be more valuable than any physics I could ever teach them." — Tom Dougherty, automotive instructor, Vintage High School

## Additional Outcomes

High school instructors appreciate the opportunities the CEC funding has created for them and their students. Because this project, campuses have benefitted from strengthened relationships with industry, enhanced recruitment efforts, increased enrollment, and expanded campus support and involvement.

### Industry Relationships Strengthened

Mark Keppel High School has several new car dealerships and independent shops represented in its advisory committee, as well as shops where students work for summer internships. The students will be able to have an advantage when they work with their mentors on hybrid vehicles. This work can become an opportunity to leave the internship with a job at the dealership.

> "I have recently been in contact with the service manager at Stevens Creek Lexus. He has reached out hoping to create a relationship with our program. He has directly expressed an interest in our students to fill some entry-level positions at his dealership." — Thane Ferguson, automotive instructor, Fremont High School

At Silicon Valley CTE, business partnerships have been created or strengthened with Tesla, Subaru, Toyota, and Ford this year in preparation of the new EV course. Original equipment manufacturers and dealership representatives have given career readiness events with the automotive students. Tesla, Ford, and local dealership representatives attended the Silicon Valley Career Technical Education College & Career Fair for the first time in November 2022 and February 2023.

> "Our district is participating the Harbor Freight Fellowship Program, which has been beneficial to students who have worked on the Switch EV. The program places auto tech education students at local automotive service business. They include mostly independent automotive service and repair facilities and some chain tire shops." — Robert Thayer, automotive instructor, Davis High School

At Schurr High School, a partnership with Shell Oil has been a huge benefit for auto students. Shell Oil provides the major support in engineering mentors for Schurr students looking to attend college and various vendors throughout our community help with supplies.

### Enhanced Recruitment Efforts

> "The Switch Lab Kit (Vehicle) was initially used as a recruitment tool during Summer 2022 to increase fall 2022 student enrollment in the auto program at Etiwanda High School, both embedded and evening courses. For 2022–2023 school year at the 8th Grade Open House, Switch Lab Kit (Vehicle) was displayed to recruit students interested in the auto program to enroll in the auto courses for summer school 2023 and fall 2023." — Curt Erales, automotive instructor, Etiwanda High School

Katella High School showcased its Switch EV at the Anaheim Unified School District College and Career Fair with about 10,000 participants and the AUHSD Steam-A-Palooza event with about 5,000. The North Orange County ROP also attended two Green Expo Events with the Switch EV. One was downtown Anaheim; the other was held at Katella High School

With the addition of the Switch EV, Mission Valley ROP has been able to market the class to a wider audience, collaborate with additional classes, and use the vehicle for advertising through local car shows.

> "The vehicle was a good overview of not only how a regular vehicle is assembled, but also the differences between a gas and electric vehicle. We have used the vehicle at our academy recruitment assembly, and it seemed to draw a crowd of young students that are interested due to its unique look." — Bill Buttinelli, automotive instructor, California High School

Clovis West High School has continued to clean and display the EV for middle school and elementary school tours. The purchased trailer is used to take the EV to other schools to recruit for the program.

## Increased Enrollment

Many instructors reported that enrollment in their courses/programs increased as a result of implementing the Switch EV project.

> "I was very pleased with my enrollment. As talk went through the school, I had a higher attendance due to students wanting to learn about electric cars. The students also found that they would be involved in learning three different trade skills. Welding classes do the design and fabrication of the frame and chassis. The small engines classes did the assembly and wiring of the electric go carts. Auto classes were able to construct, assemble, and diagnose the switch vehicle." — Mark Riley, automotive instructor, Rosamond High School

Enrollments in the Poway High School auto program have increased 50 percent since the school introduced its EV program. Instructors at Desert Mirage High School, Montclair High School, Rowland High School, and Savanna High School also reported that enrollment in their auto programs has increased.

## Expanded Campus Support

Instructors have received additional campus support for their programs in the form of space to conduct the course, advanced training for the instructors, and tools needed to complete the project. At many campuses, the EV was also requested to be displayed at back to school and open house events, community career fairs, incoming students days, spirit weeks, and parent-teacher conferences.

It was reported that Riverside County Superintendent Dr. Judy White commented on Elsinore High School's program in her state-of-the-district address.

> "The talk started with administration and through the school yearbook taking pictures/videos and interviewing students working on the switch vehicle showed a lot of support for EV program. The board of directors, along with JOYCE media, did a walk through and posted a video to show the Rosamond community how the school was

moving into going green with this exciting project." — Mark Riley, automotive instructor, Rosamond High School

Some schools collaborated with other departments on the EV build.

> "The graphics department got involved and developed logos for the car and many students came to the auto shop to see the success. The science department also got involved by running energy tests, power, speed, acceleration, friction test, and experiment on the car. The hands-on experience involved hundreds of students and drew interest from many different types of students." — Tom Dougherty, automotive instructor, Vintage High School

Elsinore High School used this grant to get other CTE and general education classes involved in the project and provided them access and exposure to the vehicle and program in general.

Examples of what the other CTE courses did:

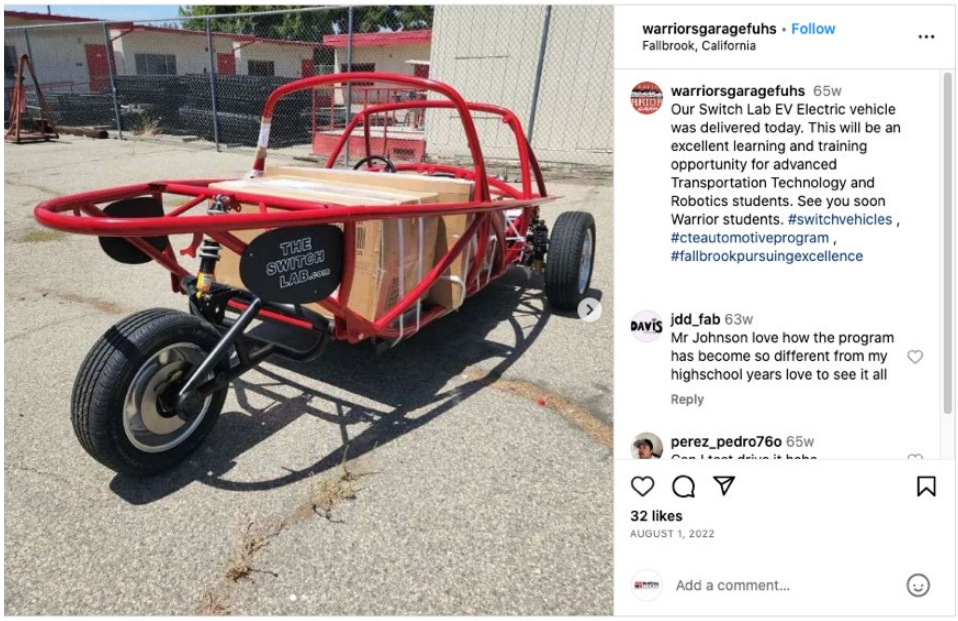
- Graphic design created a logo and printed out marketing signage to highlight the EV program area.
- Manufacturing program produced sponsor tee shirt.
- Digital photography took pictures of the vehicle and students working on the vehicle.
- The Tigers Times created a student article to add buzz to the opportunity for students.

## Community Exposure

Many auto instructors have used their Switch EVs to help expose their local communities to EV technology. Some examples include the following:

- North Orange County ROP exhibited its Switch EV at the community's National Drive Electric Week and at the Orange County Green Expo
- Rowland High School used its Switch EV in student recruitment events and community parades as part of its automotive club, the Rollin' Raiders
- Nogales High School documented its EV build on the auto program Instagram account
- Fallbrook High School documented its EV build on the auto program Instagram account.

**Figure 8: Fallbrook High School Instagram Post**




Source: Fallbrook High School

**Figure 9: North Orange County Regional Occupational Program**

**Anaheim Ducks mascot, Wildwing, and North Orange County Regional Occupational Program facility member in SWIFT vehicle at Orange County Green Expo.**

Source: North Orange County

High School Award Presentations

The project team planned to visit as many funded schools as possible during the contract period. This proved to be difficult during the pandemic as campuses were closed. However, 21 visits were made, during which each school was presented with an award plaque for its participation in this project. Plaques were shipped to the schools that did not receive in-person visits.

Award presentation videos and pictures are located on the ATL website at ZEV High School Pilot Project (https://atleducation.org/category/cec/cecvideos/high-school-pcop-videos/) and Photo Gallery (https://atleducation.org/cec/the-clean-fuels-transportation-pilot-career-opportunity-project/the-clean-fuels-transportation-pilot-career-opportunity-project-gallery-images/).

Visits were made to the following schools:

- **Bay Region:** Mission Valley ROP and Silicon Valley CTE
- **Central Valley:** Clovis West High School
- **Greater Sacramento**: Davis High School
- **Inland Empire:** Desert Mirage High School, Eitwanda High School, Montclair High School, Chaffey High School, Victor Valley High School, and Adelanto High School
- **Los Angeles/Orange County:** Katella High School, Loara High School, Buena Park, High School, Sunny Hills High School, Nogales High School, John A. Rowland High School, Schurr High School, Artesia High School, Valley High School

**Figure 10: Nogales High School Award Presentation**

**California Energy Commissioner Patty Monahan, Commissioner Noemí Gallardo, and Energy Commission Agreement Manager Larry Rillera presenting project completion award plaque to facility at Nogales High School.**

Source: Cerritos Community College

**Figure 11: Victor Valley High School Award Presentation**

**Tami Hass, California Energy Commission Transportation Integration and Production Unit supervisor presenting project completion award to students and faculty at Victor Valley High School.**

Source: Victor Valley High School

**Figure 14: Calexico High School Award Presentation**

**Instructor and EC Hall of Fame inductee, Keith Fisher, accepting project completion award from Larry Rillera, Energy Commission agreement manager.**

Source: Calexico High School

# CHAPTER 3: Recommendations

## Program Challenges

The most significant program challenges stemmed from COVID restrictions placed on campuses during the contract period. Schools that intended to implement the new curriculum during the 2019–2020 and 2020–2021 academic years were unable to complete the EV build as planned. After restrictions lifted, the schools moved forward with implementation.

Teachers and students also noted that one vehicle is not enough for a class of 25 students.

## Future Program Opportunities

This program addressed the need to increase interest in ZEV automotive technologies as a viable career pathway. It succeeded in bringing new technology to areas of the state where students may not have such opportunities. After funding the maximum number of schools possible under the agreement, the district continued to receive requests from high schools to participate in this funding opportunity. The CEC and ATL could continue to work together to bring this curriculum to additional schools across the state if funding becomes available.

ATL recommends offering a DC vehicle as well as a second vehicle that can have an AC battery. This offering would allow a more advanced student to gain an understanding of current vehicle technology.

In addition, integrating information about chargers that charge the vehicle would be beneficial to students and allow the faculty to add this important concept to their programs. The curriculum could be structured to address diagnosis symptoms that are related to the charger (rather than the vehicle).

Finally, instructors would benefit from additional training on scan tools. The goal would be to give them a better understanding of diagnostics and schematic systems, which are critical in ZEV technology.

# GLOSSARY

ADVANCED TRANSPORTATION AND LOGISTICS (ATL) — The sector of California Community Colleges working in partnership with the California Energy Commission to prepare a highly skilled, clean energy workforce in California.

ADVANCED TRANSPORTATION AND ENERGY (ATTE) CENTER — The program that was created through initiative funding from the California Community Colleges Chancellor's Office and is responsible for implementing the California Community Colleges Advanced Transportation and Logistics initiative.

CALIFORNIA DEPARTMENT OF EDUCATION (CDE) — The state agency responsible for overseeing the public school system, enforcing education law and regulations, and continuing to reform and improve public school programs.

CALIFORNIA ENERGY COMMISSION (CEC ) —The state agency established by the Warren-Alquist State Energy Resources Conservation and Development Act in 1974 (Public Resources Code, Sections 25000 et seq.) responsible for energy policy. The Energy Commission's seven major areas of responsibilities are:

1. Achieving Energy Efficiency
2. Advancing State Energy Policy
3. Developing Renewable Energy
4. Investing in Energy Innovation
5. Overseeing Energy Infrastructure
6. Preparing for Energy Emergencies

Transforming Transportation CAREER TECHNICAL EDUCATION (CTE) —A program of study that involves a multiyear sequence of courses that integrates core academic knowledge with technical and occupational knowledge to provide students with a pathway to postsecondary education and careers.

DIRECT CURRENT (DC)—A charge of electricity that flows in one direction and is the type of power that comes from a battery.

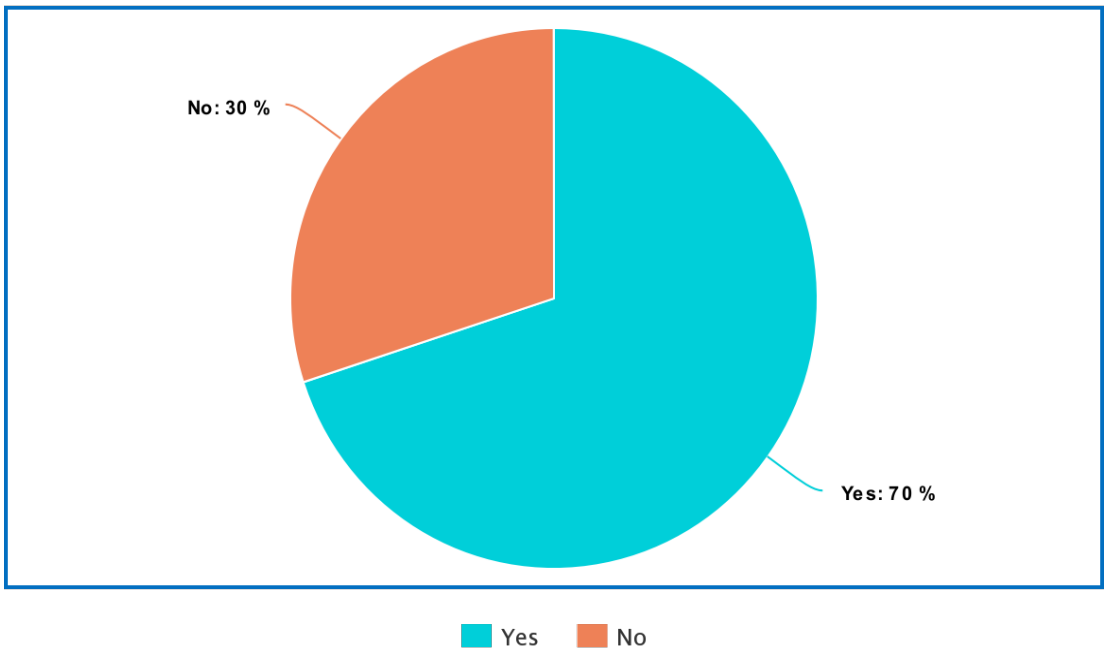
ELECTRIC VEHICLE (EV)—A broad category that includes all vehicles that are fully powered by Electricity or an Electric Motor.

SCIENCE, TECHNOLOGY, ENGINEERING, AND MATHEMATICS (STEM)—An umbrella term used used in the context of education policy or curriculum choices in schools to group together the distinct but related technical disciplines of science, technology, engineering, and mathematics.

ZERO-EMISSION VEHICLE (ZEV)—Vehicles which produce no emissions from the on-board source of power (e.g., an electric vehicle).

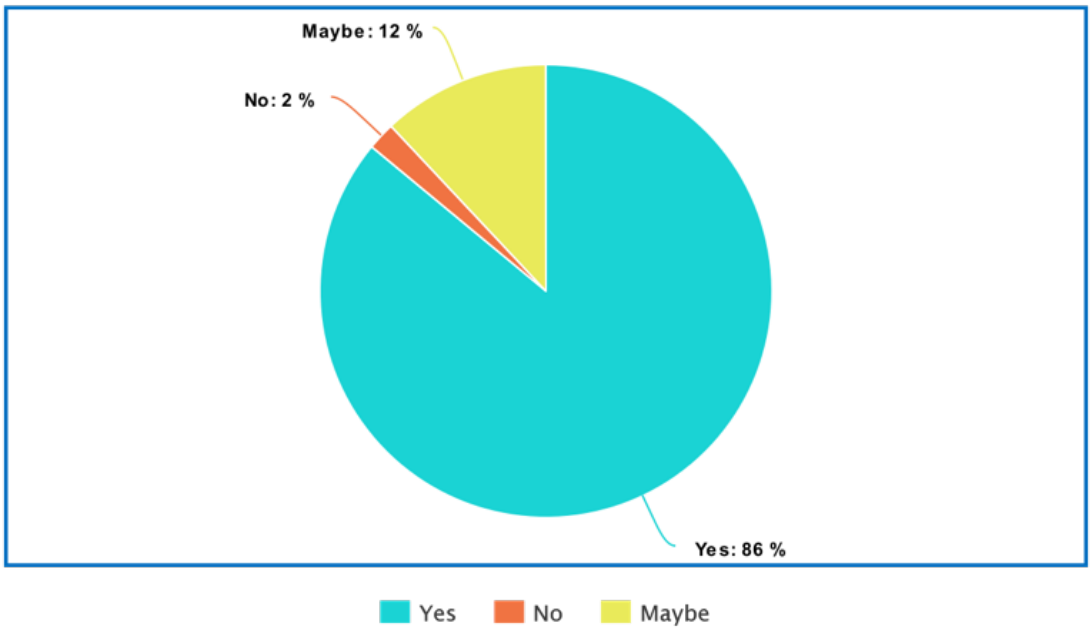
# APPENDIX A:
# Student Exit Survey Results

**Figure A-1: Student Survey – Would you consider a career in clean fuel transportation as a result of taking this class?**




Source: *Cerritos Community College*

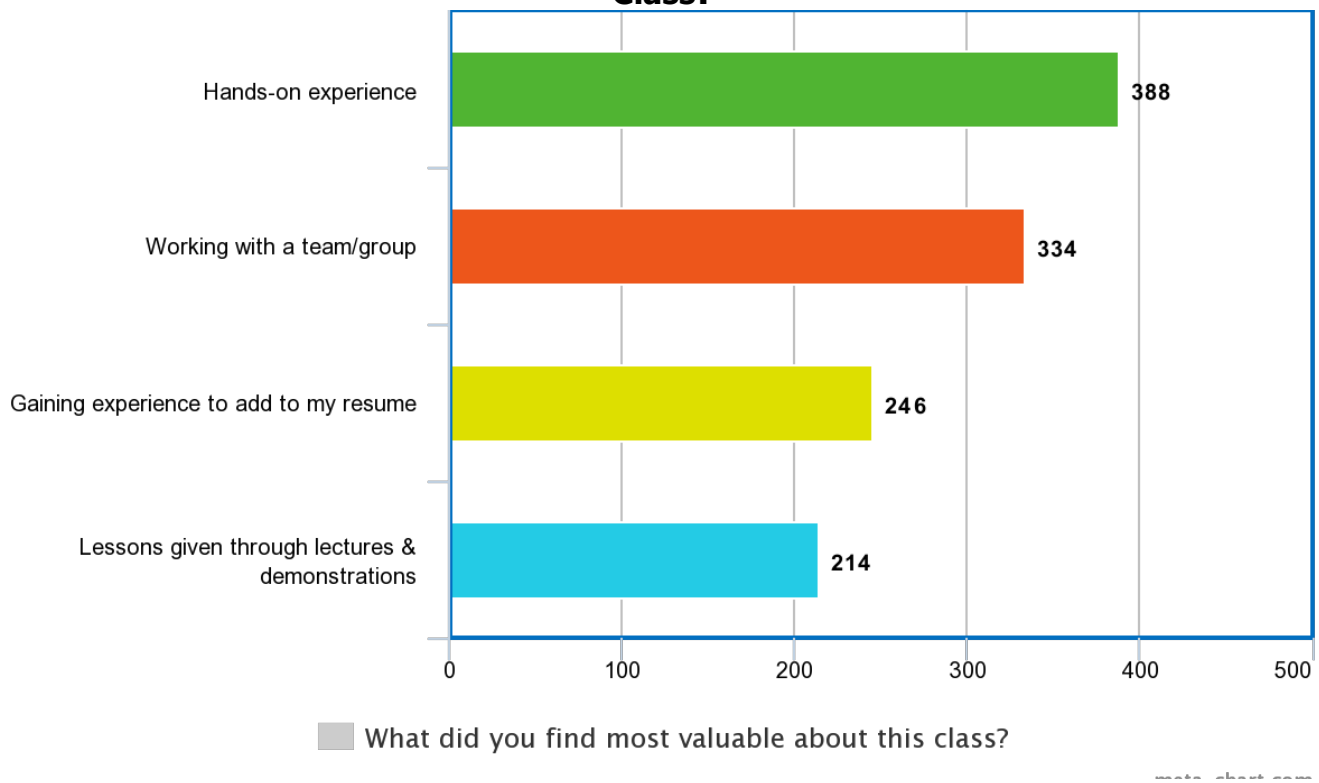
**Figure A-2: Student Survey - Would you recommend this class to others interested in this field?**




Source: *Cerritos Community College*

The following chart outlines what they found most valuable about the class, namely hands-on experience, working with a team/group, gaining experience to add to their resumes, and lessons given through lectures and demonstrations. Students were able to select more than one answer.

**Figure A-3: Student Exit Survey - What did you Find Most Valuable About This Class?**




Source: *Cerritos Community College*