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EV Apprenticeship Programs and Out of this World Supply Chain & Logistics

Justin Starr, ORCID 0000-0003-0173-7402
Community College of Allegheny County

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Community College of Allegheny County
Annual Report 2023-2024

Under the Safety21 Program, the Community College of Allegheny County (CCAC) conducted a number of activities to promote workforce development in the transportation sector, with an emphasis on the future of mobility in electric vehicles, autonomy, supply chain and artificial intelligence. The College directly served more than 450 students in programs and events, engaged with the Greater Pittsburgh Automobile Dealers Association (GPADA) and indirectly impacted more than 1000 individuals through exposure at tabling events and similar activities. This work is summarized below.

EV Apprenticeship Program Development

Dr. Justin Starr and Professor Robert Koch worked closely with the Pittsburgh Chapter of the German American Chamber of Commerce to collaborate on the development of a registered apprenticeship program for electric vehicle technicians. This program would be the first of its kind in Pennsylvania and one of very few in the country. The program was formally approved by the Commonwealth in Summer 2024 and is on track to enroll its first students in Spring 2025.

Dr. Starr and R. Koch traveled to Germany in order to learn more about what an EV Technician apprenticeship program looks like in the German Dual System of Vocational Education from multiple facets. Throughout the course of the study tour, CCAC faculty spent extensive time working with the Süd-Thüringen Handwerkshammer to understand exactly how high voltage training is integrated into traditional automotive technician programs. In addition, faculty met with several vocational schools, a German “Meister” or Master Instructor and representatives from the state government. Starr and Koch also met with the directors of apprenticeship programs at Porsche AG and Stuttgarter Straßenbahnen (the public transit authority for Stuttgart) in order to learn how EV programs are being implemented from an employer perspective.

At the conclusion of the trip, R. Koch began developing a curriculum for EV training that could exist as a supplement to CCAC’s traditional automotive technology program. This curriculum encompasses all of the German standards and is intended to be a vendor agnostic program. R. Koch convened multiple review sessions with representatives of the GPADA to ensure that the new curriculum would align with regional needs and included representation from independent garages in order to address the burgeoning aftermarket EV repair industry. Dr. Starr worked closely with the GACC, the Hillman Foundation and other sources of matching funding to source EV trainers from the same source used in Germany, Lucas Nuelle. These trainers have begun to arrive at CCAC and are in the process of being installed.

CCAC plans to launch the EV Technician program through our noncredit workforce development division in Spring 2025. Creation of a credit certificate program will follow as the college completes its governance procedures.

Publication – Robot Safety Systems: An Applied Approach

Additionally, during this period of performance, Dr. Starr completed authoring a new textbook about mobile robots entitled *Robot Safety Systems: An Applied Approach*, published by CRC Press. Dr. Starr worked with a coauthor (CCAC Adjunct Instructor and RealBotics CEO Christopher Quick) to create a new textbook that addresses the safety concerns of autonomous robots, including industrial devices, autonomous vehicles, UAVs, autonomous mobile robots (AMRs) and unmanned ground vehicles (UGVs). Dr. Starr and C. Quick worked to

leverage the lessons learned from Mobility21 and Safety21 projects in order to create a work that would be useful for advanced students, industry professionals, government regulators and other interested parties.

At the time of this report, *Robot Safety Systems* was in final copyediting and was due to be released in November, 2024. Substantive work on the project was completed during the 2023-2024 period of performance.

Odyssey Day & CTC Visits

CCAC Hosted the 2023 Odyssey Day in collaboration with Pittsburgh Region Clean Cities on Friday, October 6, 2023. The event was a full day of interactive activities that highlighted alternative fuel vehicles as well as advances in AV technology. Exhibits included buses powered by natural gas and propane, electric vehicles from Chevrolet and Tesla, and mobile battery technologies to provide solutions to limited charging station infrastructure. More than 20 exhibitors showcased new technologies, and 175 CCAC students, faculty, staff and members of the general public attended the event.

R. Koch also built on the momentum of Odyssey Day with a series of visits to Career and Technology Centers with automotive programs. Typically, Professor Koch visits between 10-15 CTCs in order to tell students about CCAC's Automotive Technology program and the career path as a technician working for a dealer. This year, R. Koch brought a demonstration Velodyne with him from the Connected Vehicle Sensors Lab to show students how Lidar works. R. Koch prepared a series of demonstrations showing how the lidar was able to map the classroom, recognize students and suffer from degraded performance when aerosols, water and dust were in the air. R Koch worked with approximately 130 students over the course of 8 visits.

AI As a Skilled Trade

Dr. Starr continued working on developing programs to promote the integration of Artificial Intelligence training into the skilled trades. Specifically, Dr. Starr worked with Mechatronics Technicians on a series of activities to showcase the strengths and weaknesses of LLMs as human-assistants for troubleshooting tasks. Mechatronics technicians were able to identify where LLMs would fail and hallucinate throughout the course of a series of activities, some of which were designed by students. More than 43 skilled trades apprentices participated in these activities.

Other students applied SLAM algorithms for autonomous vehicles into a skid-steer forklift as part of a capstone project. This work was intended to modify the lower-level controls of these algorithms to operate on a vehicle that used tracked or side steering instead of traditional axles, as well as update navigation routines to enable a skid steer to take a large object through a small opening via a series of sideways moves. The activity involved 12 students, and resulted in two prototypes: a smaller vehicle based on an NVIDIA Jetson, and a larger vehicle constructed from tube steel that the students could configure to carry a full-scale computing setup. The small prototype is currently functional, running a modified ROS environment. The large prototype remains a work in progress.

Out of this World Supply Chain and Logistics

Finally, CCAC is proud to report that Safety21 funding was used to support continued participation in the Student Spaceflight Experiments Program. Specifically, the Mission 17 experiment launched to the International Space Station and the Mission 18 experimental design competition was conducted. Safety21 funds support student research into microgravity projects that involve supply chain and logistics concerns – areas that are becoming increasingly important as commercial spaceflight accelerates in Pittsburgh.

In SSEP, teams of students compete to design experiments that are suitable for microgravity investigation. Three teams of students are selected by a panel of judges as community finalists and one experiment is sent into orbit. Mission 17 was supported by Mobility21 and involved a selection process that took place in 2022, however that student experiment only launched into space on November 9, 2023 on SpaceX CRS-29. Two CCAC students designed an experiment to determine how spaceflight would impact dormant cancer cells in order to better understand the effects of space travel on human couriers. While the results of this experiment are still being analyzed, early indications are that space travel may wake up dormant cancer cells more quickly than was previously thought.

The Mission 18 experimental design competition took place from August-November 2023. Ten teams of CCAC students presented experimental designs to a panel of judges that included Astronaut Woody Hoburg, the director of the Moonshot Museum and a VP of Engineering from Astrobotic. More than 65 students participated in the experimental design competition, and the winning experiment which exams the degradation of polyurethane used in vehicle components is scheduled to launch in October 2024. More than 250 high school students participated in patch design contests to accompany the missions, and four winning designs were selected from Parkway West Career and Technology Center. These patches will accompany the experiments and students will receive space-flown material in return.

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16. Abstract CCAC is proposing a program that strengthens the programs created under Mobility21 and lays the foundation for the first EV Technician apprenticeship program in the country, based on standards developed by the German government and a consortium of European automakers. Specifically, CCAC proposes to expand our Connected Vehicle Sensors Lab and technician education programs with the purchase of two Ouster lidar units, expand our supply chain and logistics curriculum with the purchase of an additional Skill Boss unit and support of student teams focused on orbital logistics for the Student Spaceflight Experiment Program, design a series of computer vision labs for technician education programs using Arduino hardware, and travel to Germany to receive training from the German government in EV apprenticeship programs.				
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