Members of the National Visiting Committee for the National Science Foundation’s Advanced Technical Education (NSF ATE) Center for Advanced Automotive Technology (CAAT) at Macomb Community College review the CAAT’s goals and strategies, comment on fourth year accomplishments and progress, and offer observations and recommendations for the NSF and CAAT leadership and staff.
CAAT National Visiting Committee Report

Date: 29 January 2015

Members Present:
- **Marcia Black-Watson**, Industry Talent Director, State of Michigan
- **Deborah M. Dawson, P.E.**, Director, School of Engineering and Computing Technology, Ferris State University
- **Kristin Dziczek**, Director and Assistant Research Director, Center for Automotive Research [NVC Chairperson]
- **Brad McNett**, Senior Program Advisor and HTUF Program Manager, National Automotive Center, TARDEC
- **Monica Pfarr**, Principal Investigator, Weld-Ed, National Center for Welding Education and Training, Lorrain Community College

CAAT Staff Present:
- **Bob Feldmaier**, Co-Principal Investigator, Director, CAAT Macomb Community College
- **Mary Hojnacki**, Program Manager, Macomb Community College
- **Dr. Y. Gene Liao, D.Eng.**, Co-Principal Investigator, CAAT, Associate Professor, Division of Engineering Technology, Wayne State University
- **Scott Palmer**, Co-Principal Investigator, Macomb Intermediate School District CTE Consultant
- **Joseph Petrosky**, Dean, Engineering and Advanced Technology
- **Dr. James Sawyer**, Vice President and Provost, Learning Unit, Macomb Community College
- **Dr. C.P. Yeh, Ph.D.**, Co-Principal Investigator, Director, Chair Division of Engineering Technology, Wayne State University

Others Present:
- **Dr. Debra D. Bragg**, Professor, Department of Educational Organization and Leadership, College of Education, University of Illinois at Urbana-Champaign (CAAT Evaluator)
- **Sherry Doherty**, Assistant Director, Communications, Macomb Community College

Others Not in Attendance:
- **Kevin Mull**, Vice President, Business Development, Bosch

Location: Macomb Community College, Warren, MI
Introduction:
The Center for Advanced Automotive Technology (CAAT) National Visiting Committee (NVC) met on Thursday, 29 January 2015. CAAT leadership provided the NVC with information and data to assess the current status of the Macomb Community College (MCC) and Wayne State University (WSU) National Science Foundation Advanced Technological Education Center (NSF-ATE). This report reviews the CAAT’s stated goals and strategies, the Center’s activities during the past year, and the NVC’s observations and recommendations for the CAAT team and NSF.

CAAT Strategy:
The stated purpose of the CAAT is to: “Advance the preparation of skilled technicians and designers for the automotive industry which is now developing and producing more fuel efficient, environmentally friendly vehicles.” The Center currently focuses on technologies including: hybrid electric (HEV), plug-in/extended range electric (PEV), and electric vehicles (EV); alternative fuel vehicles, including those running on advanced clean diesel, compressed natural gas (CNG), and liquefied petroleum gas (LPG); and fuel cell vehicles (FCV). The NVC views the focus on the education and training of technicians to work in these—and other—new and emerging vehicle technology areas to be addressing critical industry needs.

Briefly, the CAAT goals can be summarized in this graphic:

The CAAT’s goals are both comprehensive and critical to addressing identified industry and workforce needs in powertrain and propulsion technology education and training. The NVC strongly supports the CAAT’s innovative seed funding model as this creates ownership of and buy-in for the Center’s work; provides a mechanism for other institutions to invest in the resources
developed; efficiently builds system capacity; helps to meet industry needs in a more strategic, creative, and comprehensive manner; and expands the overall reach of the CAAT.

**CAAT Year 4 Accomplishments and NVC Observations:**
Through the CAAT, Macomb Community College (MCC) and Wayne State University (WSU) have implemented much of what it set out to accomplish in Year 4, and that the Center is achieving its goals.

**Goal 1: Generate an advanced automotive technology learning environment**

The CAAT works with industry advisors and other educational partners to identify and fund curriculum development to prepare skilled workers for jobs in the automotive industry. The CAAT also focuses on Seed Funding activities to other institutions. This innovative model emphasizes the CAAT’s education and industry partnerships and helps to build the professional advanced automotive technology skills of MCC and WSU faculty. Through the Seed Funding activities, the CAAT awarded grants to two secondary education institutions, a community college, and two universities in Year 4. Grants were made to the following institutions:

- Kent Intermediate School District (Michigan)
- Utica Community School District (Michigan)
- Ivy Tech Community College (Indiana)
- Wayne State University (Michigan)
- University of Alabama at Birmingham (Alabama)

In response to previous NVC recommendations, the CAAT evaluators interviewed six of the Center’s Seed Funding recipients to determine the results of these partnerships and uncover any challenges the recipients are facing. The evaluators found strong evidence that CAAT’s partnerships with the Seed Funding institutions are resulting in students being exposed to new information; instructors meeting other instructors; increased internal and external collaboration at the schools; development of new relationships with other educational institutions; as well as finding new funding, new equipment, and new volunteers. The challenges are the lack of data and metrics to measure program implementation and quality, which is something the NVC has noted in previous annual reviews. The CAAT evaluator is focused on deeper evaluation of the Seed Funding relationships, and collecting more and richer data on student experiences and outcomes. This is a strong Center, and anecdotal evidence is very persuasive, but this deeper evaluation—tied to measurable goals and objectives—will allow the CAAT to continue to grow and improve.

The CAAT also continues to successfully leverage the NSF ATE grant with a number of other grants from different sources that are related to electric vehicle technologies. This leveraging helps expand the reach of the CAAT beyond what is possible under the base Center grant. One example is the STEM Bridge Grant that was used to fund the EV Technician cohort.

**Goal 2: Increase awareness and understanding of advanced automotive technologies.**
The Center’s annual conference has become a showcase event; the 2014 event showed both an increase in attendance and overall very high marks on the speakers and content that was presented.
On a 5-point scale, 89 percent of attendees rated the conference “very or extremely valuable,” and the remaining 11 percent gave a rating of “moderately valuable.” Educators in attendance reported they learned new information and increased their knowledge of the future impact of automotive technologies, and a large proportion said their teaching will improve as a result of the knowledge they gained at the event. CAAT partnered with the Center for Automotive Research, the Design and Manufacturing Alliance, and SAE International to promote the event.

CAAT also sponsored a number of outreach and awareness events for students and young people, including: Robotics, Engineering and Technology (RET) days, a RET night event for students and their parents to explore growing career fields in STEM; and a hands-on Alternative Energy Vehicles Summer Academy. Through WSU’s participation in Michigan’s Louis Stokes Alliance for Minority Participation and the University Bound programs, CAAT works to target underrepresented populations to raise awareness of opportunities in STEM careers related to advanced automotive technologies. CAAT also offered an electric vehicles workshop in conjunction with the Student Day at the annual North American International Auto Show in Detroit. For the broader public, had a presence at Autorama, gave presentations at the “All Things Green” conference, and participated in the annual Michigan Electric Vehicle Show and Rally. CAAT also sponsored an electric vehicle “Ride & Drive” event for educators and the general public; surveys of participants show that more than 70 percent changed their perceptions of electric vehicle technology as a result of this activity.

Goal 3: Engage regional institutions and businesses in collaborative activities.
CAAT Leadership and Staff have built extensive networks in Southeast Michigan’s automotive and workforce development institutions, and again display incredible abilities to leverage the ATE grant with other sources of funding. For example, MCC and WSU have developed short courses in energy storage under a federal grant from the U.S. Department of Commerce, and these courses have been offered at LG Chem, Bosch, Roush, Navita Systems, Fiat Chrysler Automobiles (FCA-US), and BAE Systems. CAAT staff continues to play an important leadership role in the Michigan Academy for Green Mobility Alliance effort, the National Alternative Fuels Training Consortium, and southeast Michigan’s Workforce Innovation Network. CAAT is also an affiliate member of the non-profit Center for Automotive Research.

In response to an NVC recommendation, the CAAT has formed an Industry Advisory Council comprised of automakers (FCA-US, General Motors, and Toyota) and key suppliers (Bosch, Continental, Delphi, and Kaiser Aluminum). The Council met twice in Year 4, and has provided valuable industry advice and counsel to the CAAT leadership and staff.

CAAT’s third-party evaluator has also surveyed employer perceptions of CAAT activities, and found that many consider the CAAT to be a partner, a source to identify funding, and a place that prepares students for advanced automotive careers. The benefits of the companies’ relationship with CAAT include: addressing future business needs of the employers, improving relationships between educators and employers, updating curriculum on advanced automotive technologies, and training skilled workers.
CAAT also collaborates with other ATE centers and future ATE center applicants, including Clemson University’s CA2VES and Washtenaw Community College, has supported a hybrid Formula SAE team, and has participated in reviewing and evaluating SAE International’s exam for Certification Development of Vehicle Electrification program (CVEES).

**Goal 4: Institute an Advanced Automotive Technology website for curriculum dissemination.**

Across the board, the data gathered from the CAAT’s web presence has shown growth in Year 4. Visits, downloads, and use of CAAT materials have all improved dramatically. CAAT’s enhanced web site and new resource library content appear to be making a positive impact. The resource library now hosts 110 resources, and has been accessed over 600 times from the ATE link and nearly 75 times from the NSDL link. There were nearly 1,000 resource downloads in 2014, a 43 percent increase from 2013.

CAAT has also improved its social media presence in Year 4, which has resulted in more than 200 visits to the Center’s website. CAAT’s electronic newsletter now has nearly 600 subscribers—individuals who have opted in to receiving the communications, and that has resulted in nearly 700 website hits.

**Goal 5: Create an effective sustainability plan.**

CAAT is fortunate to have been awarded an additional $2 million to extend and expand the mission of the Center from August 2014 through July 2017, building on the Center’s original funding allocation of $1.3 million through July 2016. With this renewal, CAAT will now include lightweight and automated vehicle curriculum development in its mission. These new technology areas follow closely with developments in industry, and will help CAAT continue to be industry-relevant and industry-focused. CAAT has already begun meeting with industry, attending lightweighting and automated vehicle conferences and events, and meeting with faculty to identify curriculum gaps related to these new technology areas of focus. In addition, CAAT staff are meeting with other academic institutions and other ATE centers to identify existing resources in aluminum and composites—especially in design, forming, fabrication, and joining, as well as in electrical, mechanical, and software technical education resources to support connected and automated vehicle education and training.

CAAT is also connected to the Lightweight Innovations for Tomorrow center and the Institute for Advanced Composites Manufacturing Innovation—both of which are recently-designated federal National Network for Manufacturing Innovation centers. CAAT staff also participated in securing a federal Investing in Manufacturing Communities Partnership (IMCP) designation for southeast Michigan; as part of the Advance Michigan consortium, CAAT is eligible to apply for additional funding to expand scope or services that NSF has made available to ATE centers in IMCP-designated communities.

All of these efforts will help CAAT continue to build out a comprehensive catalog of curricula and other resources for automotive programs at the secondary and post-secondary level, to remain industry-relevant, and to sustain the mission of the Center.
NVC Year 4 Recommendations for the CAAT:

First, the NVC would like to congratulate the CAAT on the ATE renewal and the expanded mission of the center. Industry relevance continues to be a key measure of the CAAT’s success, and the NVC recognizes the importance of involving the Industry Advisory Council in guiding Center activities and engagement in the areas of lightweighting and connected and automated vehicle curriculum development. Some technologies may be deployed first in heavy trucking and construction equipment industries; CAAT can make connections in these industries by leveraging the network of one of the NVC’s members. The NVC recommends adding members to the Council to represent the new technology areas, as well as to reflect the diversity in company size that is prevalent (especially in connected and automated vehicle start-up companies). The NVC also strongly supports CAAT’s efforts to secure supplemental funding through the IMCP designation, and to leverage funding from other sources—industry, state, foundations, etc.—to expand the Center’s reach and impact.

The NVC continues to support the CAAT’s innovative Seed Funding model, and is pleased to see greater reach of the program as evidenced by the grant made to the University of Alabama. The NVC suggests that CAAT consider asking Seed Funding institutions to provide matching funds of their own to help increase the Center’s overall reach and contribution. Another suggestion is to provide opportunities for seed funding recipients to interface and collaborate with each other—either through regular conference calls, a periodic in-person meeting, or internet forums. These conversations can serve to share best practices, lend advice, and help problem solve, and will help improve the Center’s effectiveness, continued relevance, and provide critical feedback on the quality of the CAAT’s offerings. Recognizing these are only recommendations, the NVC continues to recommend the CAAT try to achieve national reach through participation key conferences and events outside the region—such as the American Association of Community Colleges Workforce Development Institute held annually in January, and the Southern Automotive Conference.

The NVC would like to offer its support for CAAT’s efforts in Year 4 to reach a broad array of students, educators, and the public through events, outreach, web resources, and traditional and social media presence. CAAT’s efforts around diversity (age, race, gender, work experience, etc.) are also recognized as an important goal, and critical to the Center’s and the industry’s success.

In previous years, the NVC has advised the CAAT to increase its efforts to secure internship, co-op, and post-completion employment opportunities for participants—and this appears to be happening. There is evidence of a greater connection to career services and a deeper integration between CAAT and the rest of the college. The NVC suggests that seed funding institutions should be encouraged to make similar connections with their career placement resources, as well as building employment bridges to employers in their own jurisdictions. Support for a 2-year program with an on-the-job-training component (such as co-op or internship or other experiential learning activity) will help market the offerings to students outside the cohorts that have utilized the powertrain and electric vehicle curriculum. The CAAT needs to consider what is the break-even point since at some point is in time, the College will have to charge for the program’s offerings. As part of the further development of the Center’s sustainability plan, the NVC recommends
estimating what it would cost to sustain the CAAT with a cohort of students who pay full tuition. CAAT should consider program alumni as part of the overall marketing plan; an alumni network that is facilitated through social media or periodic events can provide feedback on what is needed on the job that isn’t included in the curriculum. Successful alumni can serve as CAAT’s ambassadors to industry and the public, and may one day be in a position to hire CAAT students or serve on the Center’s Industry Advisory Council.

Additional recommendations and comments include:

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<thead>
<tr>
<th>Area</th>
<th>NVC Assessment/Recommendations</th>
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<tbody>
<tr>
<td>Mission/vision/goals</td>
<td>NVC looks forward to reviewing the Center’s clearly articulated changes to mission, vision and goals made necessary by the ATE renewal and broadened technology scope.</td>
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<td></td>
<td>The NVC recommends that WSU’s PIs work to map the University’s results more closely with CAAT’s goals. It is difficult for the NVC members to evaluate whether WSU has achieved the goals of the Center without a clear articulation of how the activities performed connect to CAAT’s mission, vision, and goals.</td>
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<td>Staffing and project management plan, including financial planning and reporting</td>
<td>The NVC encourages the CAAT to plan for a revolving directorship, to seek successors that bring new industry connections and networks to the Center, and to carry over the predecessor’s contacts as much as is feasible.</td>
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<tr>
<td>Institutional support</td>
<td>Continues to be very strong.</td>
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<td>Business/industry and other partnerships</td>
<td>Improving, but CAAT needs to clearly define what is a “partner”? What level of engagement signifies a true partnership vs. a less formal relationship? Need to articulate what are the benefits to collaborating with CAAT.</td>
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<tr>
<td>Main project activities or subprojects including curriculum and/or course materials</td>
<td>Work is proceeding according to plan.</td>
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<td>Documented worker or education demand and current supply/participant recruitment</td>
<td>Continue to commission research and gather data on industry needs.</td>
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<tr>
<td>Faculty recruitment/development, retention and professional development training</td>
<td>Exemplary—the NVC commends the CAAT in this area.</td>
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Publicity/website, newsletter, media coverage/Dissemination

The Committee is pleased to see broader marketing efforts—including radio and print media hits in Year 4. NVC continues to encourage the CAAT to seek broader dissemination of the program through mass and social media outlets, especially in conjunction with seed-grant recipient organizations.

Consider using subject matter experts to review course materials in the resource library.

Overall evaluation of project

Excellent progress.

Conclusion:
The CAAT at Macomb Community College continues to addressing critical automotive industry needs for advanced powertrain technicians in pre-production, production and post-production environments. The NVC strongly supports the Center’s expanded mission, and acknowledge the new technologies will require cultivation of many new relationships and development of a wider array of expertise in the coming year. CAAT’s seed funding approach has produced a much broader impact in preparing students to meet critical industry needs than otherwise would be the case, and the NVC continues to stress that the Center and the NSF must find ways to document and replicate CAAT’s extended reach and impact.

The NVC commends the CAAT on a very strong fourth year.

Respectfully submitted,

Kristin Dziczek, CAAT NVC Chair
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