Center for Advanced Automotive Technology
Third Party Evaluation Report

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INTRODUCTION

This final third-party evaluation (TPE) report on the Center for Advanced Automotive Technology (CAAT) at Macomb Community College examines the Center’s fulfillment and perceived impact on key goals that were established by CAAT’s creation of a strategic plan three years ago in FY2014. Since that time, the plan has been executed under the direction of the CAAT leadership team and they have also been used to structure the activities of the TPE.

The mission of the CAAT, as articulated in a presentation by the CAAT leadership team to the 2016 National Visiting Committee (NVC), follows:

*The Center for Advanced Automotive Technology (CAAT) advances the mission of the ATE program through building open-source curriculum resources and distributing them widely through www.autocaat.org, being a center of expertise in both the education and industrial communities and connecting, and convening industry and academia to ensure education programs meet the needs and expected outcomes for technicians within the many sectors of the automotive industry. CAAT addresses the needs of both education and industry, supporting the creation of stronger automotive curricula and ensuring it meets the needs of the industry.*

The five goals of the CAAT’s strategic scope of work appear in Figure 1 below, with this report addressing all five goals including the sustainability of CAAT. The question of sustainability of CAAT has been an especially important focus of the TPE’s data collection during FY2017 due to the NSF ATE decision to conclude CAAT’s current grant. Therefore, this 2017 report is the last in a series of TPE reports on the CAAT website at: [http://autocaat.org/About_CAAT/Oversight/Third_Party_Evaluation/](http://autocaat.org/About_CAAT/Oversight/Third_Party_Evaluation/)

*Figure 1. The strategic goals of CAAT.*
EVALUATION METHODS

Results of the TPE that pertain to CAAT’s strategic goals are presented in this report, along with a description of recommendations for sustaining the CAAT. Figure A-1 in the Appendix shows graphic that is useful to depicting the relationships between the internal and external evaluation data collection processes, which emerged from CAAT’s strategic planning process in FY2014. The coordination of leadership and involvement by the CAAT leadership team and the TPE illustrates the decision of these individuals to engage in data collection in strategic ways (for example, most surveys are conducted by the CAAT team and most site visits and interviews are conducted by the TPE). Together, the two entities combine their data and share what they are learning to create a holistic picture of the operations and potential impact of CAAT.

The evaluation methods align with the strategic goals as follows:

With respect to **Goal 1: Generate an Advanced Automotive Technology (AAT) Learning Environment**, the TPE conducted a number of data collection activities relative to seed funding, including the following:

- The TPE reviewed data gathered by a CAAT team member on the seed funding recipients, partially to address questions raised by the National Visiting Committee (NVC).
- Three seed funding recipients (Jackson State University, Lansing Community College, Wayne State University) were interviewed via telephone in May 2017 regarding the status of their projects, the perceived impact of their efforts, and the extent and ways in which the outputs of the seed funding has been sustained.

To address **Goal 2: Increase awareness and understanding of AAT** the TPE conducted a document review of the CAAT presentation materials and monthly calendars to describe the education, employment and other groups from Southwest Michigan, other parts of Michigan, and other states in the United States. This information was used to portray the efforts of the CAAT team to increase awareness of AAT, as well as to create the opportunity to develop partnerships or strengthen on-going partnerships. The primary method related to this goal is described briefly below.

- The TPE assessed efforts of the CAAT team to provide outreach to K12 education during FY2017. This data collection involved gathering information about CAAT’s scope of work relative to educational outreach pertaining to building and enhancing the “STEM pipeline” through outreach to middles schools, and analyzing surveys of Middle School teachers and students conducted by the CAAT team leader for STEM Outreach.

To address **Goal 3: Engage regional institutions and businesses in collaboration activities**, the TPE gathered data through multiple methods, including an follow-up survey of 2016 CAAT Annual Conference, a end-of-meeting survey conducted with the 2017 CAAT Annual Conference attendees, and telephone interviews with industry partners who serve on the CAAT’s business advisory council, and others knowledgeable of the CAAT’s activities in the region. Each of these methods is described briefly below.

- An online survey was conducted with 2016 CAAT Annual Conference attendees. The Survey Monkey questionnaire was conducted in October-November 2016 for the purposes of gathering data from attendees of the previous 2016 annual CAAT conference. Similar to previous years, this survey gathered qualitative data on the value that conference attendees placed on the information they obtained at the annual conference, the impact that the conference experience had on their increasing their professional networks, and related concerns.
A survey was conducted with attendees of the 2017 CAAT Annual conference, immediately following the meeting held the end of April 2017. The questionnaire asked participants to offer their opinions of the value of the various speakers and sessions, their perceptions of their potential to use the information in their work, their recommendations about future conferences including topics of importance to them, and so forth.

A telephone interview was conducted with industry partners between May 15 and June 1, 2017. This survey invited industry partners to discuss their perceptions of the purpose, importance and possible impact of CAAT. In addition, the partners were asked to share their thoughts on whether CAAT should be sustained beyond the current NSF ATE grant period, and if so, what should be the focus and agenda of the Center. With this sustainability in mind, the respondents were asked to recommend sources of funding CAAT, including funding from the auto-related business sector.

To address Goal 4: Institute an AAT website for curriculum dissemination, the TPE analyzed data from Google analytics on CAAT’s website, also providing data on social media usage over time. These data include trends in website usage in the United States and internationally.

To address Goal 5: Continue to develop and implement sustainability plans, the TPE conducted telephone interviews with a wide range of constituents and stakeholders of CAAT to gather their insights and recommendations on sustaining CAAT beyond the current NSF ATE funding period.

Table 1 summarizes the data collection methods and the number of respondents who participated in surveys and telephone interviews to gather information to evaluate CAAT during FY2017. The report also reflects information gathered and analyzed by the TPE using documents and the CAAT website.

Table 1. Summary Data Collection Methods, Sources, and Respondents for this FY2017 Report

<table>
<thead>
<tr>
<th>Data Collection Method</th>
<th>Source</th>
<th>Number Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY2017 Online Survey on FY2016 Annual CAAT Conference</td>
<td>FY2016 conference attendees</td>
<td>40</td>
</tr>
<tr>
<td>FY2017 CAAT Annual Conference Survey</td>
<td>All conference attendees</td>
<td>80</td>
</tr>
<tr>
<td>FY2017 STEM Outreach survey for students</td>
<td>Over 4,000 Middle School students in 3 counties</td>
<td>3,322</td>
</tr>
<tr>
<td>FY2017 STEM Outreach survey for teachers</td>
<td>40 Middle School teachers in 3 counties</td>
<td>40</td>
</tr>
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<td>Telephone Interviews</td>
<td>Macomb Community College employees, including CAAT team members</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Wayne State University employees (co-PI)</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Seed funding recipients</td>
<td>5</td>
</tr>
<tr>
<td>Data Collection Method</td>
<td>Source</td>
<td>Number Respondents</td>
</tr>
<tr>
<td>------------------------</td>
<td>---------------------------------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td></td>
<td>Industry advisory members</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Community college partners</td>
<td>2</td>
</tr>
<tr>
<td>Text (Paper or Electronic) Review</td>
<td>Seed funding spreadsheet and materials on CAAT website</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>CAAT website scan</td>
<td>NA</td>
</tr>
</tbody>
</table>

*Note: NA means Not Applicable*

**RESULTS**

This report presents evaluation results for FY2017 according to the following strategic goals:

- **Goal 1**: Generate an Advanced Automotive Technology (AAT) Learning Environment
- **Goal 2**: Increase Awareness and Understanding of AAT
- **Goal 3**: Engage Regional Institutions and Businesses in Collaboration Activities
- **Goal 4**: Institute an AAT Website for Curriculum Dissemination
- **Goal 5**: Continue to Develop and Implement Sustainability Plans.

**Goal 1: Generate an Advanced Automotive Technology (AAT) Learning Environment**

This section of the report describes the CAAT’s activities pertaining to seed funding as well as program development at Macomb Community College. The on-going seed funding activities represent an important defining element of the CAAT’s theory of change in that the Center sought to support the development of AAT curriculum for use by community colleges in Michigan, the Midwest region, and also through the rest of the country and internationally. In addition, the CAAT leadership has played a critical role in the creation and approval of a new associate’s degree program of study pertaining to AAT, and this activity is described in this section as well.

**Seed Funding**

The seed funding strategy is a primary mechanism for CAAT to address goal 1, which focuses on generating an advanced automotive technology (AAT) learning environment. In FY2017, the TPE focused on four projects that were at various stages of completion to gather in-depth information about the expected and actual impact of seed funding. The TPE asked questions about each project’s accomplishments and outputs, curricula that was developed and disseminated, and student benefits from learning the curriculum. Four organizations that were contacted via telephone to talk about their seed funding projects were Jackson State University, Kettering University, Lansing Community College, and Wayne State University.

It is also noteworthy the data collection pertaining to seed funding was supported and supplemented by a member of the CAAT leadership team. The member of the team who has responsibility for seed funding monitors and sustains the seed funding project, and he is a generous contributor to gathering data about the seed funding projects. The TPE commends the CAAT team for engaging in the evaluation process in this proactive and supportive manner, which is consistent with the vision for internal and external
evaluation being conducted in a coordinated and collaborative manner (see again Appendix A-1). In addition, the CAAT team has enhanced curriculum quality control, including consistency of formatting and documenting curriculum materials, utilizing information that the team members learned through their work on the Trade Adjustment Act Community College and Career Training (TAACCCT), U.S. Department of Labor grant for the National STEM Consortium. Additional information about this Consortium can be found at: http://www.oeeconsortium.org/projects/showcases/the-national-stem-consortium/ and http://ccri.uw.edu/wp-content/uploads/2017/02/bridges.pdf.

Information about the 17 seed funding projects, including the project title, start and end dates, funding amounts, and completion status, is shown in Table 2 below. The table shows that the seed funding has been awarded to educational institutions at all levels, including K-12 school districts, community colleges, and universities. Also, the funding has been distributed to entities in Michigan and well as out of the state of Michigan.

Table 2. Summary of Seed Funding Awarded by CAAT Through FY2017

<table>
<thead>
<tr>
<th>Institution</th>
<th>Title</th>
<th>Contract Date</th>
<th>Completion Date</th>
<th>Amount</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Lawrence Technological University (MI)</td>
<td>Hybrid-based modules for two mechatronics courses</td>
<td>5/12/2011</td>
<td>11/7/2011</td>
<td>$22,278</td>
<td>Completed</td>
</tr>
<tr>
<td>2 Lewis and Clark CC (IL)</td>
<td>Modified ASE certification courses to include hybrid/EV impacts</td>
<td>6/1/2011</td>
<td>11/7/2011</td>
<td>$27,540</td>
<td>Completed</td>
</tr>
<tr>
<td>3 Grand Rapids CC (MI)</td>
<td>Curriculum for battery manufacturing job training</td>
<td>6/1/2011</td>
<td>5/22/2012</td>
<td>$8,403</td>
<td>Completed</td>
</tr>
<tr>
<td>4 Lansing CC (MI)</td>
<td>Hybrid and EV overview modules for technician workforce and general public</td>
<td>2/8/2012</td>
<td>7/26/2012</td>
<td>$13,180</td>
<td>Completed</td>
</tr>
<tr>
<td>5 Grand Valley State University &amp; Muskegon Community College (MI)</td>
<td>Modules for Li-ion battery reclamation technology</td>
<td>5/8/2012</td>
<td>3/31/2013</td>
<td>$25,000</td>
<td>Completed</td>
</tr>
<tr>
<td>6 Ivy Tech CC (IN)</td>
<td>Course module on integrating EV charging stations to “Off Grid” energy center</td>
<td>5/14/2013</td>
<td>10/15/2014</td>
<td>$22,299</td>
<td>Completed</td>
</tr>
<tr>
<td>7 Kent Intermediate School District (MI)</td>
<td>Project-based module for HS based on design, build, test and competition of an EV</td>
<td>11/4/2013</td>
<td>7/31/2014</td>
<td>$16,000</td>
<td>Completed</td>
</tr>
<tr>
<td>8 Utica Community Schools (MI)</td>
<td>Middle school CTE bridge course based on design and build of an EV</td>
<td>3/10/2014</td>
<td>11/30/2014</td>
<td>$22,000</td>
<td>Completed</td>
</tr>
<tr>
<td>Institution</td>
<td>Title</td>
<td>Contract Date</td>
<td>Completion Date</td>
<td>Amount</td>
<td>Status</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-----------------------------------------------------------------------</td>
<td>---------------</td>
<td>-----------------</td>
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</tr>
<tr>
<td>9  Wayne State University (MI)</td>
<td>Course module for technicians and engineers on the analysis and control of electric motors</td>
<td>2/13/2014</td>
<td>1/31/2015</td>
<td>$16,122</td>
<td>Completed</td>
</tr>
<tr>
<td>10 University of Alabama at Birmingham (AL)</td>
<td>Course for technicians and engineers in Energy Efficiency of HEVs and EVs, Labs</td>
<td>7/28/2014</td>
<td>7/20/2015</td>
<td>$25,000</td>
<td>Completed</td>
</tr>
<tr>
<td>11 Jackson State University (MS)</td>
<td>Two courses, one on sensors used in vehicle navigation and one on integrated navigation systems</td>
<td>7/20/15</td>
<td>7/31/16</td>
<td>$25,000</td>
<td>Completed</td>
</tr>
<tr>
<td>12 Kettering University (MI)</td>
<td>Course on design with composite materials</td>
<td>11/2/15</td>
<td>3/5/16</td>
<td>$12,000</td>
<td>Completed</td>
</tr>
<tr>
<td>13 Roane State University (TN)</td>
<td>Short-term lightweight metals welding course</td>
<td>2/22/16</td>
<td>2/22/17</td>
<td>$25,000</td>
<td>Completed</td>
</tr>
<tr>
<td>14 Kettering University (MI)</td>
<td>Designing with aluminum for automotive technologies</td>
<td>3/7/16</td>
<td>7/11/16</td>
<td>$24,000</td>
<td>Completed</td>
</tr>
<tr>
<td>15 Springfield Technical CC (MA)</td>
<td>Automated, connected and intelligent vehicles</td>
<td>3/7/16</td>
<td>3/7/17</td>
<td>$20,000</td>
<td>Completed</td>
</tr>
<tr>
<td>16 Kettering University (MI)</td>
<td>Joining aluminum to aluminum and dissimilar materials</td>
<td>4/11/16</td>
<td>8/29/16</td>
<td>$22,000</td>
<td>Completed</td>
</tr>
<tr>
<td>17 University of Alabama Birmingham (AL)</td>
<td>Experimental testing of vehicles</td>
<td>11/1/16</td>
<td>7/24/17</td>
<td>$25,000</td>
<td>Project in progress</td>
</tr>
</tbody>
</table>

Figure 2 summarizes the 17 seed funding awards thus from 2011 to 2016, accounting for just over $350,000 in NSF ATE funding from the CAAT to community colleges and universities in Michigan, the Midwest, and also in the Northeast and Southeast regions of the country. The smallest award was made to Grand Rapids Community College, totaling $8,403, and the largest recipient of seed funding dollars was Kettering University, securing a total of $58,000 in three awards. The average award was approximately $20,600 over the course of the CAAT grant with NSF ATE.
Figure 2. CAAT seed funding by institution from FY2011 to FY2017.

Figure 3 shows four major outcomes associated with the 15 completed seed funding projects, with the largest area of focus being hybrid or EV. However, as Table 1 above shows, most of the seed funding project investments in hybrid or EV projects were made early in the project, with the later focus being on lightweighting and connected automated vehicles. This shift aligns with changes in the automotive industry that reflect continued advancement in various forms of electronic technology. From the standpoint of the CAAT leadership and its business advisory council, it is very important for CAAT to be current with industry changes in technology. By using the seed funding strategy to reflect these developments, it is possible to support community colleges and universities in the development and dissemination of new curriculum that is needed by community colleges and their K-12 and university partners throughout the region, nationally and also internationally since the CAAT also has an international reach. These results provide tangible evidence that CAAT is responsive to the NSF ATE program’s goals of responding to industry changes, a point that is echoed in the interviews conducted by the TPE with business/industry advisory council members below.
An important addition to the seed funding work that has taken place since the CAAT was formed is the creation of a set of standards and guidelines for the materials that are included in this effort. This developed was spearheaded by a member of the CAAT leadership team, building on lessons learned about curriculum design and dissemination in the open-source format through the Trade Adjustment Act Community College Career Training (TAACCCT) program. These developments include the inclusion of:

- Comprehensive Syllabus and Lesson Plans – Course objectives mapped to the lesson plans, homework, quizzes, tests
- Lecture materials and textbook recommendations
- Homework, quizzes, tests, and lab activities

All materials developed through the CAAT seed funding efforts are available free of charge on the CAAT web site at: http://autocaat.org/Educators/Seed_Funding/

The following section summarizes the activities and expected impact of selected seed funding projects based on site visits and phone interviews conducted by the TPE. The seed funding projects conducted by Wayne State University, Jackson State University, and Kettering University and presented in this report. Previous TPE reports available on the CAAT website provide details about seed funding projects at other institutions.

**Wayne State University – Seed Funding Project Summary**

CAAT funds were awarded in 2012 to WSU’s Division of Engineering Technology to be used for the development of a course in motor control. An important feature of the course developed by a faculty member employed by the Division of Engineering Technology was engagement of students in theory as well as hands-on labs. Now that the course has been developed and piloted, it has become integrated into the regular on-going teaching load at WSU for students in the Division of Engineering Technology, and a version of the course is also believed to be useful to community college students.
When asked if the seed funding project was beneficial to the Division of Engineering Technology and its students, the faculty member gave a positive response. The Division leader said, “It makes a difference to our students because [we] are using new course material in terms of upgrading the software. They can understand the content much better. Students don’t know [about motors] but by operating the software, the learning is very straightforward. It’s good for us to do this, and it’s beneficial to our students to do this.” The faculty member went on to express hope that community colleges will adapt the course material for students at the 2-year college level.

**Jackson State University – Seed Funding Project Summary**

The focus of the seed funding project at Jackson State University was on connected and automated vehicles, which resulted in the following two curricular products:

- IT 311 – Sensors Used In Connected and Automated Vehicles
- IT 312 – Navigation Techniques in Automated and Connected Vehicles

The two courses were developed and pilot tested before they were fully taught and accepted by the undergraduate curriculum committee. To this effect, a faculty member noted, “We’ve been able to contact the local automotive industry and other professional schools that teach automotive technology at the high school and community college level. It was primarily the seed funding that led to development of two courses which helped to establish a 2+2 program in our department.” They are now admitting students at Jackson State who have completed two years in automotive technology in the community college who then continue their education. The two new courses have been developed, verified and adopted so the project is fully integrated so that students can take them before they graduate.

The faculty member also noted, “In the major automotive industry that we have here, the branch of the workforce comes from the community college and [these 2-year college students] now completes the 4-year degree [that we] developed with courses and now teach online. We’ve tested one of the courses.” The fact that these courses are being taught at Jackson State and are now being adapted for elementary school children is a bonus that was not anticipated when the seed funding project was initiated. Per the delivery at the middle school level, the project team introduced the material through a 1-week learning experience where the children were engaged in STEM activities. The faculty member who did this work described the students response as very positive, and he explained that his own level of pride and motivation at being involved in a project that was doing so much good for learner audiences. He described the impact as being beyond anything he expected at the start.

To summarize the faculty member’s perception of the value of the project, the individual said, “It’s a blessing. I will forever be grateful for this privilege. It’s exposed people and school teachers to know about what EV is all about even though the politicians here don’t understand the importance of it. I’m still looking for opportunities to [establish a] work relationship with CAAT at Macomb.” The individual went on to explain that he is hoping to take a sabbatical from Jackson State University to spend extended time at MCC to work with the CAAT team.

**Kettering University – Seed Funding Project Summary**

The largest investment of seed funding was made by CAAT to Kettering University at $58,000 to develop three lightweighting course modules, with the following focus:

- Design with Composite Materials
- Design with Aluminum
- Joining Aluminum to Itself and Dissimilar Materials
Once developed, three modules were combined to create a new course at MCC titled *Advanced Materials* (PRDE 2918), which is associated with 48 contact hours. This course is taught as part of the Michigan Advanced Technician Training (MAT®) Program. In its initial offering with a Kettering University faculty member who also helped to develop the course, results were positive. All students received a grade of A or B, despite the large volume of material that was covered, which was a concern for the instructor. The instructor described the students as responsive, inquisitive, and positively disposed toward the learning. The only concern expressed by the students was that they wanted more students to enroll in the course, beyond the initial group of 9 or 10 who participated in the class.

Asked what difference the seed funding made to the Kettering University faculty group, one said, “We didn’t have the resources to do this. [The seed funding] enabled us to do something that we needed to do. It was groundwork. We had been interested in this topic for a couple of years, we know the technology is coming up and this gave 3-4 of us some time to work on this project. We created 70-90 slides per module, 400+ slides.” The faculty also talked about accessing research papers presented at ASEE and U Tube videos to show the “hands-on” to the students. The faculty also mentioned attending the CAAT conference where they met “nice people [who are] close to industry”. A member of the team also mentioned offering professional development courses in this region, offering that “there is a very strong interest in industry for vehicle lightweighting… There is a market through PD that people in industry would be attracted to…. [these] materials would allow you to do that. We’ve done continuing education (CE) courses as well.” These comments show the versatility of the courses and offer important insight into an approach to further extending the seed funding investment to additional audiences. In a time when CAAT is looking to sustain its scope of work, this insight should be considered part of the future strategic plan. The Kettering faculty mentioned that the CAAT leadership is already looking toward implementing this idea.

**Goal 2: Increase Awareness and Understanding of AAT**

The CAAT has continued to advance the goal of increasing awareness and understanding of advanced automotive technology (AAT) among middle school students. This section provides a description of two activities that the CAAT delivers, one that involves the students and teachers, and the other that involves the students and parents. In the *Science, Technology, Engineering and Math (STEM) Outreach Lab* activity, a member of the CAAT team goes to middle schools to conduct science labs that involve a large number of middle schools, teachers and students. Currently, the CAAT website lists 11 STEM Labs for the teachers to choose from, but one lab had to be removed midway through the school year due to the inability to get quality supplies. In the second activity, the CAAT offers *STEM Career Exploration Labs* to groups of students and their parents (maximum 20 per lab) to introduce students to careers in STEM and engineering. This activity includes 3 of labs that are offered on the website to make one 3 hour session. There have been a few modified Career Exploration Labs offered throughout the two years of service. The STEM Outreach Labs are more popular and reach more students due to the involvement of the middle schools and the amount of science classes that are taught in the schools. A link to the STEM Lab can be found at: [http://autocaat.org/Educators/STEMlabs/Lab_Descriptions/](http://autocaat.org/Educators/STEMlabs/Lab_Descriptions/)

An important goal of both activities is to introduce students, many of whom have no knowledge of what engineering and STEM careers look like, to begin to consider the possibility of working in these types of career fields. Through the scientific investigations, these labs help the students improve their problem-solving and higher order thinking skills. They are required to transform their ideas into practical solutions based on modeling, testing, evaluating and modifying.

Looking at both of these lab activities, the CAAT team has made substantial progress over the last two years (FY2016 and FY2017) as these activities have matured and spread throughout the region. With respect to the *STEM Outreach Labs*, middle school students are engaged in hands-on learning activities
conducted in their schools to improve their 3-dimensional learning skills [aligned with Next Generation Science Standards (NGSS)].

Per the STEM Outreach Labs, a total of 40 teachers and 4,102 students were asked to fill out a survey in FY2017. Of those asked to complete the survey, all 40 teachers and 3,322 students did so. All of the middle school students were enrolled in grades 6 through 8 in 15 different middle schools and 134 classrooms located in 4 counties Macomb, Oakland, Wayne and Lapeer during FY2017.

The middle school student survey results are shown below, with a comparison of results for FY2016 and FY2017. Figure 4 shows a larger percentage of the students responding in FY2017 rated the STEM labs as moderately or somewhat challenging than the FY2016 students.

![Image of bar chart showing survey results]

*Figure 4. FY2016 and FY2017 middle school student survey responses on level of challenge of STEM labs.*

Figure 5 shows the extent to which the middle school students thought their participation in the STEM Outreach Lab peaked their interest in pursuing an engineering career. Results for the FY2016 and FY2017 show a similar percentage of the groups are extremely or very interested in an engineering career, but a larger percentage of students in the FY2016 cohort are moderately or somewhat interested in an engineering career than the FY2017 cohort who is more highly represented in the not at all interested group.
Figure 5. FY2016 and FY2017 middle school student survey responses on their interest in an engineering career.

Figure 6 asks the middle school students a similar question about their interest in a STEM career and in this case, the results show nearly identical results for the FY2016 and FY2017 students in that about 29-31% of the two groups are extremely or very interested, 54% are moderately or somewhat interested, and 16-18% are not at all interested.

Figure 6. FY2016 and FY2017 middle school student survey responses on their interest in a STEM career.

Favorable comments from the middle school students about the STEM Outreach lab learning experiences include:
- “I learned a lot and STEM made me even more interested in engineering.”
Some student comments of a less favorable nature focus on a range of issues, including time, technology, and teammate cooperation. Several of the responses reflected a personal disappointment because they wanted more or were frustrated with their own performance.

- “It was harder than I expected.”
- “There was not enough time.”
- “I wish there was more technology included like robotics.”
- “The materials could have been better.”
- “It was a struggle with the wheels.”
- “It was hard to work in groups.”
- “I hoped we would have done better at the contest.”
- “My teammates did not help too much.”

The middle school teacher survey responses for FY2017 were also analyzed, with results in Figure 7 showing very favorable results. All of the teacher respondents rated the value of the labs as extremely or very valuable. None rated the labs at a lesser value level (see Figure 7).

![Figure 7. Middle school teacher perception of the value of the STEM Outreach Labs.](image-url)
The following statements were gathered from 40 middle school teachers who participated in survey about the STEM Outreach Lab that was conducted with their students. These findings provide insights into the value the teachers see in the labs. Two noteworthy themes that emerge are the value that teachers place on integrating the information about STEM and engineering into their own curriculum and teaching practices, and also the higher level of engagement that they see in their students compared to other classroom instruction that is provided through the existing curriculum. These statements from FY2017 are consistent with findings from the teacher survey conducted in FY2016 as well.

• “Students who normally struggle or refuse to participate were actively engaged and learning.”
• “Overall wonderful experience and will definitely want to incorporate more STEM Outreach labs into my curriculum.”
• “The kids love the STEM labs, and I think it helps them become better thinkers and problem solvers.”
• “This activity was a great connection to our in class unit.”
• “My students were engaged and excited about engineering.”
• “The kids loved it and were able to flex their brains.”
• “I found the planning sheet very helpful for the students to come up with their ideas. It also facilitated discussions and allowed me to question their ideas.”
• “The PowerPoint presentation was great in giving them a purpose and understanding how they can contribute to a career in the future.”
• “Would love the option to check out lab materials to incorporate into my curriculum.”

In addition to these activities, the CAAT sponsors summer STEM Career Exploration Labs that are scheduled for June 28, 2017 and July 19, 2017 involve 20 students and their parents (20 is set as maximum). Because these events happen after the final date of this report, there are no results.

Also, it is noteworthy that the level of outreach by the CAAT team is sufficiently important to the region that media stories were run in FY2016. Two stories illustrating the importance of the STEM Outreach Labs can be found at the following links:


Also, during the FY2017, the STEM Outreach Labs were advertised in the CAAT Tracks newsletter and at Auto-STEAM Days, a field trip activity for middle school and high school students, hosted jointly by Macomb Community College and CAAT on October 19-20, 2016. This event combined the CAAT’s highly successful Automotive Design and Engineering Career Expo with Macomb's Robotics, Engineering, and Technology (RET) Days event. Students learned about careers in automotive design, robotics, manufacturing, and the technology that makes it happen. Two different sectors were involved with this activity:

• **Automotive Design and Engineering** sector had exhibits by General Motors on clay/digital modeling, Fiat Chrysler Automobiles on sketching, and Ford Motor Company on production design, and Magna on automated and connected vehicles. There was also a car show that let students sit behind the wheel and talk to real automobile designers and engineers.
• **Manufacturing and Technology** sector offered an exhibit on vehicle electrification and drivetrains by American Axle & Manufacturing, on virtual welding by Macomb Community College, and on coding/traffic light programming by Siemens. There was also an exhibit by Bosch on augmented reality and crash detection.
Coverage of this event can be found on TV Warren News link, and an article in the Macomb Daily can be found at: http://www.macombdaily.com/article/MD/20161020/NEWS/161029987.

Macomb Community College Curriculum Reform

Having taken considerable time to review employer needs and strengthen relationships with faculty at Macomb Community College (MCC), a major curriculum update took place in 2016-17 that is attributable, in part, to the CAAT leadership. During FY2017, the faculty instituted a new course requirement for all degree programs that would mean all students. The course numbered and titled AUTO 2450 – Hybrid and Alternative Fuel Vehicles, is not part of all automotive AAS programs of study. The course offers 3 semester credit hours and “provides an introduction to Hybrids and Alternative Fuel Vehicles. Material covered includes high voltage batteries, regenerative braking, safety procedures, hybrid maintenance and diagnostics. Carbon-based fuels and future propulsion options will be included.” (see: http://ecatalog.macomb.edu/preview_program.php?catoid=17&poid=3287&returnto=724).

In addition, the CAAT leadership team has worked together with MCC faculty to propose a new degree program of study in Vehicle Development Technician. The MCC associate dean who was interviewed about the program spoke of the critical role that the CAAT leadership team, including the director, played in persisting to move this program from the idea stage to approval by the MCC curriculum review committee. Though the program has not yet been offered, there is excitement at the college about the potential for this program of study to represent a new hybrid form of education that merges old and new automotive technology concepts with other engineering, engineering technology, and technician education and training perspectives. Individuals who enroll in this program are expected to fill positions in research and development, testing, product design, and so forth. The focus is not automotive maintenance and service, which is the lifeblood of many community college automotive programs. Rather, in an environment when automotive technologies are changing so rapidly, particularly with the integration of electronics and computing technologies, this interdisciplinary program of study represents a new “break the mold” vision of community college technical education.

Table 3 below shows the core courses that are offered as part of the new technician program, and additional information about other educational programs developed at MCC and offered there and elsewhere with the support of CAAT can be found at: http://autocaat.org/WebForms/Page_2Column.aspx?pageid=539.
Table 3. Vehicle Development Technician Core Courses

<table>
<thead>
<tr>
<th>System</th>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>AUTO 1000 Automotive Systems</td>
<td>3</td>
</tr>
<tr>
<td>Engines</td>
<td>AUTO 1200 Automotive Engines</td>
<td>3</td>
</tr>
<tr>
<td>Brakes</td>
<td>AUTO 1100 Auto Brake Systems</td>
<td>3</td>
</tr>
<tr>
<td>Chassis</td>
<td>AUTO 1130 Auto Steering and Suspension</td>
<td>3</td>
</tr>
<tr>
<td>Electrical-</td>
<td>AUTO 1040 Auto Electrical I</td>
<td>3</td>
</tr>
<tr>
<td>Electronics</td>
<td>AUTO 1050 Auto Electrical II</td>
<td>3</td>
</tr>
<tr>
<td>Other</td>
<td>NEW Connected/Automated Vehicles (STCC seed funding)</td>
<td>3</td>
</tr>
<tr>
<td>Electronics:</td>
<td>TMTH 1150 RCL Analysis</td>
<td>4</td>
</tr>
<tr>
<td>Fundamentals</td>
<td>ELEC 1161 Electronic Technology 1</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>ELEC 1171 Electronic Technology 2</td>
<td>3</td>
</tr>
<tr>
<td>Applications</td>
<td>ELEC 1211 Digital Electronics Basics</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>ELEC 2150 Labview Basics 1</td>
<td>3</td>
</tr>
<tr>
<td>General</td>
<td>ITCS 1140 Intro to Program Design &amp; Development</td>
<td>4</td>
</tr>
<tr>
<td>Networking</td>
<td>ITNT 1500 Principles of Networking</td>
<td>4</td>
</tr>
<tr>
<td>Testing</td>
<td>NEW AUTO Experimental Testing w/ lab (UAB, Birmingham seed funding)</td>
<td>4</td>
</tr>
<tr>
<td>Product Design</td>
<td>PRDE 1250 Basic Blueprint Reading</td>
<td>2</td>
</tr>
<tr>
<td>Science Elective</td>
<td>PHYS 1180 Physics</td>
<td>4</td>
</tr>
</tbody>
</table>

**Goal 3: Engage Regional Institutions and Businesses in Collaboration Activities**

Goal 3 represents a major focus of the CAAT scope of work. Activities associated with the goal include the annual conference as well as the industry advisory council, among other areas of collaboration. This section provides a description of the 2016 conference survey follow-up survey, followed by results from the FY2017 annual conference including comparisons with previous conference results. This section concludes with results from TPE interviews with nearly all the current members of CAAT’s industry.
advisory council. These individuals were asked to reflect on their knowledge of CAAT and comment on their impressions of its impact in education and industry. They were also asked to advise on strategies to sustain the CAAT organization after NSF ATE funds conclude in FY2017.

2016 Annual Conference Follow-up Survey

The follow-up survey of the CAAT annual conference was conducted for a fourth year. The 2016 conference follow-up survey was conducted during the period of November 7 through December 2, 2016 to gather data on the impact of the CAAT annual conference held on May 1, 2016. An online survey using Survey Monkey was emailed to all 2016 conference attendees using contact information provided by the CAAT team. The purpose of the survey is to learn the extent to which respondents valued the conference, what information they used since attending the conference, and what they think has changed for them and their students since attending the conference.

A total of 40 people responded to the 2016 CAAT Conference Follow-Up Survey, with 38 indicating that they attended the conference. Of the 40 respondents, 29 provided information on their professional backgrounds, indicating that 38% were employed by community college, 31% by universities, 7% by K-12 education, 21% by industry, and 3% by government agencies. Of all respondents, 32 provided useable answers on the majority of survey questions, and this number is slightly lower than the number of useable responses to the 2015 CAAT Conference Follow-Up Survey.

Figure 8 shows 44% of the respondents thought the 2016 CAAT annual conference was extremely valuable, 41% thought it was very valuable, and 16% thought it was somewhat valuable. Combining the two highest categories, this means over 84% of respondents rated the 2016 annual as extremely or highly valuable to them. This high level of rating that comes approximately 6 months after the conference, after giving the respondents ample time to reflect on what they learned and how they used the conference information, is impressive.

Figure 8. Percentage responses on level of value of the 2016 CAAT annual conference.
Selected verbatim comments regarding the value of the conference appear below:

• Information was detailed and timely
• Networking lead to a grant proposal
• It was very interesting. Learned some new things. Met new people related to automotive connected technologies.
• Excellent update on what is happening with autonomous vehicle development.
• This conference allowed me to see the possibility of the cyber security dept and the automotive dept working to develop a class
• Exposed to many information that make clarity to former ambiguities.
• Great technology and future awareness
• The speakers were engaging and the information and interaction between presenters and guests were beneficial.
• Great summary on autonomous vehicles and detailed discussions on issues around the trend.
• Gave me food for thought, ideas to think about while developing automotive courses.

Results shown in Figure 9 show about 42% of survey respondents thought the 2016 CAAT annual conference had a “very great amount” of utility (measured using the word “usefulness”) to them. About 48% said the information had a “great amount” of utility; and a combined 10% said the conference information had either a “fair amount” of utility or was “not at all” useful.

![Figure 9. Percentage responses on the usefulness of information acquired at the 2016 CAAT annual conference.](image)

Four verbatim comments were provided on the usefulness of the conference information and they follow:

• Helped me understand how dynamic and expansive this technology issue is and the need to make supportive efforts in my organization a priority
• Some new information, but much was things I was already aware of
• Always good to get latest thinking and what is available for students
• Overview of the industry was a great keynote address
Whether the CAAT conference changed respondents thinking or behaviors was also investigated by the online survey. The vast majority of respondents (75%) indicated that the conference changed their way of thinking about opportunities in automotive technology, with only 25% indicating that it had not (see Figure 10).

![Figure 10](image_url)

Figure 10. Percentage responses on whether the conference changed participants’ thinking about opportunities in automotive technology.

Verbatim comments supplied by 12 respondents pertaining to the way the conference changed their thinking or behavior. Selected responses appear below and show that, while some of the information was new, some confirmed what the respondents thought was happening in the industry.

- It clarified the importance of autonomous vehicles (and related technologies) in the future
- The conference greatly reflects what has been going in automotive technology
- New technologies
- Not sure what you are really asking, but I don't think the conference changed my approach to looking for new automotive technology
- Helps me to be better informed so I can more effectively advise and counsel students and parents.
- Already knew that Automotive sector is place to make it known to students and parents who still think it is a dead job area
- Curriculum updates and structure of training program
- Affirmed opportunities
- Battery powered vehicle
- Aware of change of direction in both college degrees and CTE programs
- It provided new and important information, and contacts, although it did not change the way I think about opportunities.

Survey respondents were asked to supply a written response to an open-ended question about the most valuable aspects of the conference. Twenty respondents supplied information to this question, with the most often cited response having to do with the speakers and presentations. This response differs from the past years when networking was the most prominent theme. A verbatim list of responses appears below:

- The speakers were great
• Delphi presentation on ADAS
• Cyber-security is becoming number one issue
• Networking
• Listening to the presentations
• All
• Outlining challenges
• Speeches
• Speakers with reputations
• I was invited as a guest for a panel meeting without much prior knowledge about the CAAT and its members. It was a good opportunity to learn CAAT activities there.
• Learning all the new ideas.
• Panel discussions
• The subject experts
• Information offered by the automotive industry
• Presenters & presentations.
• The presentations
• Relation between keynote address and subsequent speaker topics
• Challenges faced by the self-driving vehicles
• Speakers, timelines of advancement in new technologies, shortages in critical staffing areas, technology talks,
• Networking and key speakers.

An open-ended question focused on what conference attendees wished they had learned that they did not receive. A total of 17 responses were received, with many indicating there was nothing they wanted to learn that they did not receive. A list of the substantive responses appears in verbatim format below:

• Future Sensor technologies
• More about the potential economic impact of autonomous vehicles, especially trucks
• Some feedback or challenges CAAT members encountered dealing with advanced vehicle systems as an educator and also as an expert who deals with technicians who face daily challenges.
• More of the automotive industry's plans for the future
• Integration of autonomous cars into 'mobility' ecosystem.
• Where I could go to get technical training on autonomous vehicles

Thirteen responses were received from conference attendees regarding suggestions for topics, speakers, and other activities. A few respondents indicated that they had no recommendations for future conferences but a number offered ideas ranging from education/training options to new technologies. A verbatim list of topics of interest to the respondents appears below:

• How educators can support the talent development needs
• Often it is preaching to choir. Need more media exposure. Administrators of schools, government officials and business leaders need to work together for good of students and future well prepared workforce. Get new faces to attend
• Navigation sensors - addressing their errors. Collaboration among manufacturers
• Wireless networking between automobiles
• Cover all aspects of mobility in the SE Michigan region.
• More on mass transit
• Technical training on autonomous vehicles

Survey responses for the three years of the grant are shown in Figures 11-13 below wherein the results consistently show a higher level of value, utility and persuasion concerning AAT as the years passed, with the 2016 conference consistently showing the most positive results (notice, the darker blue circle representing the highest level is larger in the outer ring in all three figures.) These findings suggest the CAAT team was improving as it gained more experience with the conference by providing the attendees who represent a range of stakeholder groups with information that they can use to meet their employment and professional commitments.

![Figure 11. Comparison of results on the value of the 2014, 2015, and 2016 annual conferences.](image-url)
Figure 12. Comparison of results on the utility of the 2014, 2015, and 2016 annual conferences.

Figure 13. Comparison of results on whether the conference changed respondents thinking about automotive technologies for the 2014, 2015, and 2016 annual conferences.
2017 Annual CAAT Conference

The annual conference is one of the most important activities carried out by the CAAT. Starting in spring 2012, this meeting was held at Macomb Community College with attendees from the local region and state. As the annual conference matured over the years, the number of attendees grew substantially, with about 90 registrants reported in 2013 and 134 attendees in Spring 2017. Eight of the attendees were also CAAT seed funding recipients, and this group was similar in size to the group of seed funding recipients who attended the 2016 conference when a concerted effort was made by the CAAT leadership team to encourage this group to attend in the annual conference.

Eighty conference attendees completed the end-of-conference survey, providing about a 60% response rate, which is respectable for this type of instrument. The survey did not ask respondents to indicate their professional or organizational affiliation so it is not possible to know who responded according to their affiliation, but registration information that included such information showed the 2017 conference attendees represented community college, university and K-12 education, employers, government agencies, and other groups affiliated with the automotive industry.

Results of the end-of-conference survey show the participants found the first set of speakers the most valuable, with from half to two-thirds of respondents giving the speakers an “extremely valuable” rating. The speakers and panels that followed were not as highly rated, with about one-third or fewer of the respondents indicating that the speakers or panel warranted an “extremely valuable” rating. However, in all cases, the speakers and panels were rated as moderately, very or extremely valuable by the vast majority of conference attendees (see Table 4).

Table 4. Number of Respondents on the Value of Plenary Session Speakers and Panel Discussions

<table>
<thead>
<tr>
<th>Plenary Session Speakers and Panel Discussion</th>
<th>Extremely Valuable</th>
<th>Very Valuable</th>
<th>Moderately Valuable</th>
<th>Slightly Valuable</th>
<th>Not Valuable</th>
<th>NA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keynote Speaker</td>
<td>51</td>
<td>27</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Tech Talk</td>
<td>28</td>
<td>42</td>
<td>7</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Workplace Reports</td>
<td>39</td>
<td>34</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Workforce Needs Panel</td>
<td>25</td>
<td>34</td>
<td>10</td>
<td>3</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>CAAT Course Update</td>
<td>21</td>
<td>31</td>
<td>10</td>
<td>1</td>
<td>2</td>
<td>15</td>
</tr>
</tbody>
</table>

Source: This table originated from data gathered from end-of-conference surveys conducted by the CAAT team.
Note: NA means Not Applicable

Table 5 shows the results on how “valuable” the respondents though the major components of the conference (networking, information and overall) were to them, with the highest responses attributed to the overall conference, then the information and materials and finally the networking. This pattern of response is similar to the responses to the 2016 CAAT Annual Conference.
Table 5. Number of Respondents on the Value of the Conference

<table>
<thead>
<tr>
<th>General Conference</th>
<th>Extremely Valuable</th>
<th>Very Valuable</th>
<th>Moderately Valuable</th>
<th>Slightly Valuable</th>
<th>Not Valuable</th>
<th>NA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Networking opportunities</td>
<td>22</td>
<td>34</td>
<td>16</td>
<td>4</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Information and materials</td>
<td>31</td>
<td>42</td>
<td>5</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Overall conference</td>
<td>36</td>
<td>40</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

*Note: NA means Not Applicable*

These responses were confirmed in a latter part of the survey that asked respondents what aspects of the conference they found most valuable wherein the responses were conference presentations (68 respondents), conference materials (32 respondents), and networking (27 respondents).

In terms of the anticipated impact of the conference, attendees who completed the survey reported that the 2017 CAAT conference had a large impact. All of the items were rated “very large extent” or “large extent” except for one, with one item showing more responses at the “large” than “very large” level. This item was that the conference “lessened my need to understand the basics of advanced automotive technologies (because I know more about them now)” (see Table 5 below). This item suggests the respondents recognize that there is more to learn about AAT and that the CAAT conference did not (and could not) deliver all the information that one would need to know to be fully knowledgeable about AAT. Otherwise, the items all consistently show the impact of the conference was consistently high on awareness, knowledge of future impact, knowledge of career opportunities, trends, and collaboration with education and employers.

Table 6. Number of Respondents on the Impact of the Conference

<table>
<thead>
<tr>
<th>Conference Impact</th>
<th>Very Large Extent</th>
<th>Large Extent</th>
<th>Moderate Extent</th>
<th>Small Extent</th>
<th>Very Small Extent</th>
<th>NA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased my awareness of advanced automotive technologies.</td>
<td>33</td>
<td>34</td>
<td>11</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Increased my knowledge of the future impact of advanced automotive technologies.</td>
<td>34</td>
<td>35</td>
<td>9</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Lessened my need to understand the basics of advanced automotive technologies (because I know more about them now.)</td>
<td>14</td>
<td>35</td>
<td>13</td>
<td>4</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Increased my knowledge of career opportunities associated with advanced automotive technologies.</td>
<td>36</td>
<td>31</td>
<td>9</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Increased my understanding of trends in advanced automotive</td>
<td>33</td>
<td>38</td>
<td>7</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>
The 2017 CAAT Conference Survey also included items requesting input from educators who attended the conference. A total of 41 educators representing K-12 schools, community colleges, and universities provided feedback on items having to do with the impact of the conference on teaching and learning outcomes. These educators were asked to indicate the extent to which they agreed with six statements about the outcomes of the conference. These items were rated on a 5-point Likert scale, ranging from 5 for “Strongly Agree” to 1 for “Strongly Disagree”. The option of NA for “Not Applicable” was included in the survey for individuals who were not educators or who were educators choose not to respond.

Results showed a high level of agreement with statements about the conference’s outcomes (see Table 6 below). Similarly to responses to these items in past CAAT conferences, results show the respondents strongly agreed or agreed with outcomes that they perceived relevant to themselves and their own work as teachers and instructors at various levels of the educational system, from K-12 to community college to university. Items linked to applying new information to teaching and improving teaching were rated at high levels too, indicating nearly all respondents felt that they believed they would benefit or their students would benefit from their attending the conference.

A number of open-ended courses were included in the end-of-workshop survey, and these questions and responses are listed below in verbatim fashion to enable the reader to discern their relevance and meaning to the CAAT’s impact.

**How will you use what you learned today?**

- Educating my business of the need to develop skill sets at younger ages – interns, etc.
- Change expectation that the skill set is already out there – it needs to be developed.
- Participate in my bright future.
- Encouraged to work with MCC for candidates for employment.
- Take advantage of resources I have been made aware of to help bridge the gap between employer needs and available talent.
- By implementing into my lesson plans.
- Take my career farther.
- Will share with my fellow adjunct instructors.
- Encouragement to learn more about FCEV.
- CAAT website for curriculum development.
- Support my work with education, workforce and economic development.
- To think of developing new aspects of course in the lightweighting and aluminum joining technologies perhaps using hybrid joining teachings.
Table 7. *Number of Educator’s Respondents on the Impact of the Conference on Outcomes*

<table>
<thead>
<tr>
<th>Statements about the Conference for Teachers and Instructors</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neither Agree or Disagree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
<th>NA</th>
</tr>
</thead>
<tbody>
<tr>
<td>I learned new information by attending the conference.</td>
<td>23</td>
<td>17</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>39</td>
</tr>
<tr>
<td>I will apply the new information that I learned at the conference to my teaching.</td>
<td>17</td>
<td>20</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>40</td>
</tr>
<tr>
<td>My teaching will improve as a result of learning new information at the conference.</td>
<td>14</td>
<td>17</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>42</td>
</tr>
<tr>
<td>My teaching of new information from the conference will increase my students’ interest in advanced automotive technologies.</td>
<td>16</td>
<td>15</td>
<td>5</td>
<td>0</td>
<td>2</td>
<td>42</td>
</tr>
<tr>
<td>My teaching of new information from the conference will increase my students’ knowledge of advanced automotive technologies.</td>
<td>18</td>
<td>16</td>
<td>5</td>
<td>0</td>
<td>1</td>
<td>40</td>
</tr>
<tr>
<td>My teaching of new information from the conference will increase my students’ academic achievement.</td>
<td>11</td>
<td>16</td>
<td>8</td>
<td>0</td>
<td>1</td>
<td>44</td>
</tr>
</tbody>
</table>

*Note:* NA means Not Applicable

Comments from conference respondents on learning follow:
- I will use what I learned today and share it with the students that I work with. What I found really helpful was the personal competencies discussed in the report on page 9. Students must possess effective soft skills such as critical thinking and problem solving.
- It keeps me informed of tech and employment trends.
- In collaborating with others in the industry.
- I understand how valuable the training/education programs at MCC/CAAT are.
- I will contact the program in the future for possible new hires for my company.
- To get students involved in other programs.
- Continue to push the most recent technologies in my classroom.
- I graduated from GMI/Kettering in Flint, MI. I did not see representation from Kettering here at the CAAT Conference. I am willing to share this information with Kettering leadership to improve the recruitment of HS students into these careers. Especially the women students should be highly recruited.
- I will incorporate this into my classes and discuss with administration the need of additional courses from what we learned today.
- To help stop driverless cars from being made.
- V10’s and 12’s are done because of you.
If you’ve attended the CAAT conference in the past, what impact has this conference had on your work?

- How industry is changing so fast.
- Job-needs awareness.
- I work hard at bringing attention at the high school level on training and education of CTE courses and apprenticeships. Recruiting students for skilled trades.
- Relaying information to my students and re-directing their career aspirations to more practical (automotive) disciplines.
- Always good resource to be a champion for STEM and keeping education/training programs focused on current and emerging needs.
- More information about industry.
- It has had the greatest impact on identifying areas in which there are skills gaps.
- Ability to regularly converse and push people on the workforce development issues.
- Gives better practical understanding of the complexities in the industry.
- I am a retired GM Engineering Manager and CAAT has kept me updated. I will contact GMI/Kettering to see if they can join the CAAT organization.
- It increased awareness of Advanced Technology and the need to educate our students in these areas.
- It shows me your weaknesses.

What impact has CAAT had on your work?

- Education of industry needs and challenges.
- It has been a great tool for me to incorporate in my classroom.
- Focus on training.
- Enlightened perspective.
- Thinking about developing curriculum in Electric Vehicle Development Certificate and/or Advanced Manufacturing.
- Provides current information on emerging technology fields and how they impact our lives.
- Updated information.
- Participated and delivered several invited talks and a course offering at Kettering and abroad.
- It has given me a greater appreciation of the work involved in having an effective and efficient talent pool.
- Primarily credibility, i.e., keep up with what’s current.
- Helps refine goals.
- I am a former student of the Advanced Battery Technology program at M-Tec Macomb. I now have a great career (going on 5 years) in EV Charging (EVSE).
- I am looking at writing a CAAT Grant.
- They are the reason we can’t have V10’s or 12’s

CAAT Industry Advisory Feedback

In FY2017, the CAAT leadership team and TPE decided to place more attention on gathering data from the CAAT industry advisory committee members, so the TPE conducted 30-45 minute telephone interviews with these individuals. The questions asked the industry advisory members to describe their role in working with CAAT, indicate the most valuable contribute that CAAT has made, describe the primary beneficiaries of CAAT, describe what they thought CAAT could or should have done differently, describe that CAAT should do to advance it’s agenda, and offer any other recommendation. The responses of the six industry advisory members are summarized in bullet points below to provide a concise depiction of the major themes that emerged in these interviews.
• There was strong agreement among the industry advisory council members that CAAT is focused in an area of critical skill shortage and that the Center has done a very good job of informing the field broadly about this workforce need. They also praised CAAT for staying abreast of industry changes and maintaining a strong sense of the pulse of rapid change that is happening in the EV/autonomous vehicle industry space. There was also recognition that this field is not easy to understand so given the complexity of the technology, as well as the ever-changing economic and political context that surrounds this work, the CAAT has done a remarkable job of helping to define and lead the education sector in the evolving EV/autonomous vehicle marketplace. To this end, one respondent commented, “The focus is on EV has been strong but there are a lot of other areas. Autonomous driving is a great area that everyone is struggling with. Finding engineers to fill those roles and finding that specialist or technician class that is also critical to industry is another area that we struggle with.” This individual praised the CAAT for filling this gap in a strong way. Also speaking with conviction to the positive leadership from CAAT, one respondent said, “Leadership with [name of the CAAT team leader] and team is good. There is passion, and we get that from the team. MCC is supporting it well. For me, it’s very good.”

• The industry council members understand 2-year and 4-year college programs of study are different, and they appreciate the merits of programs offered by both types of schools, but they readily admit they are less familiar with 2-year technician programs. Several noted that they were not community or technical college students – mostly their backgrounds are engineering degrees from 4-year universities – so they have incomplete knowledge of what these programs are about and what they could be. Given that major caveat, they think the 2-year technician programs offered by MCC, including the new Vehicle Development Technician program, are a very good idea. Speaking to this issue, one respondent commented, “We tend as an industry to focus on 4-year and advanced degrees in engineering, and we leap over the focus and gifts of a technical education. That’s a problem. We need all of that.”

• When asked about accomplishments, several of the industry advisory council members spoke about the successful model that the CAAT had created, and they felt that this model should be replicated by community colleges and other educational organizations. When asked to explain the model, there was no one specific set of elements that the council members described consistently, but what emerged was the overall “pipeline” notion of beginning to build interest in STEM and engineering with middle school students; offering technician education with certificates and degrees at the community college level, possibly including the university in 2+2 arrangement; and strengthening relationships with industry to place students. Various aspects of this model were more meaningful to some industry council members than others (for example, outreach to K-12, student internships, faculty development), but the overall idea of building a coherent idea of a pathway that would increase interest among K-12 students to enroll in technician education that is relevant to industry was highly valued.

• The industry advisory council members spoke positively about actions that the CAAT leadership team had taken to gather information from them and demonstrate that that information was valued in strategic planning. They were especially appreciative of having been invited to provide input on the Vehicle Development Technician program and other certifications that were viewed as valuable to their industry. This exchange of information seemed to build interest and trust in ways that some industry advisory council members saw as rare with community colleges.

• When asked what they would change if they could wave a magic wand, several of the industry advisory council members mentioned their company’s distance from MCC, and they lamented that their local community college did not have the programs that are available at MCC. They understood that proximity was not something that could be changed, but they wanted CAAT to play
a larger leadership role in communicating and coordinating the programs that are being developed at MCC that could be useful to other community colleges in the region. One respondent spoke to this issue by saying, “If I look at MCC, it could be dispatching [this information about advanced automotive technology] all over the country. The programs that CAAT is offering, it could be put out to prepare up so individuals can fulfill those needs.”

• When asked how the CAAT could do things differently, several industry advisory council members spoke about the importance of state of the art laboratories, and they gently questioned whether MCC’s laboratories are adequate. To this end, one respondent said, “I think we need to continue to improve on the laboratories and have this technology where the students can live it day to day.” A few mentioned that their companies had donated equipment to MCC or WSU and that they thought more such donations may be feasible in the future. For these individuals, the hands-on learning that occurs in laboratories is critical to highly functioning technician employees mastering the skills they will need to work in their companies.

• Also when asked how the CAAT could do things differently, a common response was to ramp up apprenticeships and internships so that more students come to industry with considerable work experience. Some of the industry advisory members mentioned work-based learning programs that they had benefited from engaging in as undergraduates or leading in their companies, and they thought the CAAT leadership should pursue those opportunities more aggressively to provide the best form of education possible for technicians.

• When asked what groups have benefited most from CAAT, the respondents’ answers ranged widely. Some said the automotive industry had benefited the most while others said students or community colleges/universities had reaped the most benefit from CAAT. The fact that this question solicited such widely varying responses is interesting in that it suggests the intended outcomes of the CAAT may not have been clear to the industry advisory council members, and in fact this point was mentioned by several respondents. While they valued their experience with CAAT and saw merit in the Center’s work, several noted that they were not entirely clear about what the end game was for CAAT so it was hard for them to assess whether the Center was accomplishing it’s intended goals or to make comments on how it was doing.

• Finally, a few of the industry advisory council members admitted that they have not been a strong advocates for CAAT as they could or should have been. They talked about taking CAAT for granted in some ways, and expecting that CAAT through its role within MCC and WSU to accomplish more than was realistic. To this end, one respondent said, “They’ve done the best to fan out the information. It’s the pull from industry that hasn’t been there for them. They’ve done right but the industry hasn’t seen the awareness to go to them. That’s the exposure to go to them and how to use them that needs to be developed”. This issue is delved into more fully in industry advisory council member and other respondent responses pertaining to Goal 5 on sustainability that is discussed below.

Goal 4: Institute an AAT Website for Curriculum Dissemination

With respect to the CAAT website, webinar and other social media, CAAT’s level of engagement with its various constituents continued to grow during FY2017, with a high level of activity has continued in July 2016- April 2017. The following figures produced by the CAAT leadership team provide a comprehensive picture of usage and potential impact of the CAAT. The methodology for the TPE’s accessing these data come through her partnership with the CAAT team wherein the team uses Google analytics to evaluate web presence and social media utilization over the course of the grant and shares that information with the TPE.
Figures 14-19 show that CAAT’s web and social media activities increased in FY2017 to an unprecedented level (based on a comparison of this evaluation report to previous reports). Except for the month of August 2016, all months in FY2017 saw more visits than comparable months in FY2016, with an average of 2,525 visits per month compared to 1,760 visits per month for FY2016. For the entire fiscal year of FY2017, more than 9,100 more visits were made to the CAAT website than FY2016.

![Graph showing total visits to the CAAT website for FY2017 compared to FY2016.](image)

*Figure 14. The total number of visits to the CAAT website for FY2017 compared to total visits in FY2016.*

Figure 15 shows fiscal year results by quarter for FY2014 to FY2017. Over this 4-year period, the CAAT’s web visits tripled, beginning with approximately 10,000 visits in FY2014 to over 30,000 visits in FY2017. Over the 4-year period, the CAAT website received over 75,000 visits.
Figure 15. Number of CAAT website visits for the four quarters of FY2014 through FY2017.

Figure 16 shows the number of unique new and returning users for each month of the FY2017, with the number of unique users far exceeding the number of returning users for every month of the year. A rise in new users is especially evident in early FY2017 (February – May).

Figure 16. Average pages of new visitors versus returning visitors for FY2017.

Figure 17 shows the average number of pages viewed by returning users versus new users, with results showing much more variation among new users. This finding may reflect the familiarity that returning users have with the website compared to new users who enter the site to search for a particular item.
Figure 17. Average number of pages of new visitors versus returning visitors for FY2017.

Figure 18 shows organic searches represent the greatest number of referrals in FY2017, with direct coming next. Referral, email and social media were less likely the source of searches.

Figure 18. Number of referrals by type for each month of FY2017.

Figure 19 shows the number of domestic versus international views for FY2017. Except for the months of September 2016 and March-April 2017, the number of views is fairly similar for these two groups.
Figure 19. Comparison of number of international versus domestic views, less Macomb Community College (MCC) views, for FY2017.

Goal 5: Continue to Develop and Implement Sustainability Plans

All interviewee groups were asked by the TPE to comment on ways that the CAAT could think about sustaining its agenda or modifying its agenda to ensure a brighter future without NSF ATE funding. To this end, the TPE asked respondents to make recommendations about sustaining CAAT and to offer insights into the ways their organizations and companies might be able to contribute information, resources, and support. The following bullet list summarizes the major points that emerged from the interviews with all of these groups, with about 20 individuals providing information in response to the TPE sustainability questions.

- From an industry perspective, one comment that was common was that equipment donations were the easiest way to support the CAAT. Some respondents mentioned that they companies had already made donations to both MCC and WSU, and they thought future donations would be possible.

- With respect to monetary donations, the responses of interviewees varied greatly. A few respondents thought the amount of money to sustain CAAT (estimate at $700K per year) was not large. They tended to think if a good strategic proposal and plan could be developed, it would not be a difficult sell to major automotive industry in Detroit area. On the other hand, some respondents said while the need may be there, they did not think their companies would invest with considerable research on the workforce need and evidence of the impact that that CAAT has already had on placing students into employment and ensuring that their career trajectories are valued within automotive companies.
• With respect to the timing of pursuing a sustainability plan, again, there were a wide variety of responses. Some respondents thought the timing was good because the up-tick in the economy was creating a severe enough need that companies would be able and eager to invest in workforce development while others thought CAAT should have been working a sustainability plan far before this point. One respondent went so far as to describe the NSF ATE as a form of “welfare” that the CAAT has relied upon for too long. They viewed any federal investment as creating reliance on resources that should come from industry and local communities, although this individual did not indicate that his company was willing to invest in CAAT. This individual’s verbatim commentary may be useful to read to explain this point:

  I think CAAT did a great job, but I wish we could have addressed the sustainability question from the industry standpoint earlier, and put in a parallel program for manufacturing. I know we need one in tooling... I kind of have a personal philosophy that, as far as I’m concerned, we shouldn’t consider this a welfare project. I wish the vision was on how we could get off the welfare state [so this is not] just another effort from the government. Seed money with government funding [is OK] to put together a concept, but right up front we should have gone for self-sustainability as soon as possible and not spent time hoping for another grant. We’ve got a tremendous value proposition. What’s the budget here? I think I recall $700K. That’s not real money to these companies. That’s not serious money… These things should stand by themselves in a vastly competitive global market where technology to survive means everything and nothing is standing still. We need sales persons to sell the value proposition and get people signed up.

Along this same line, another respondent recommended that that CAAT team keep in mind the phrase “What’s in it for me?” when thinking of investments from industry. This individual offered that if there is not a compelling “package” it is unlikely for industry to invest even when the request is not a large sum of money. Though unstated, it seemed the respondent was saying that the response to “what’s in it for me?” was not clear from CAAT, at least from his perspective.

• One respondent focused on improving partnerships to ensure that the resources are spread to as many entities as are needed to create a networked workforce development model for AAT. This individual emphasized the need for “data to support what it is”. They recommended that the CAAT team gather testimonials that help to explain what the value of the program is from the standpoint of graduates and employers.

• Several respondents spoke about the importance of the whole CAAT team of being more visible and engaged in the industry. They often recognized and praised CAAT’s director, but they have less understanding of the full capacity of CAAT and whether it could sustain a larger investment. They mentioned the importance of the CAAT annual conference, workshops and booths, and suggested that these are places where potential funders may glean a sense of what CAAT is about and what it can achieve.

• Similar to the previous bullet, one respondent urged the CAAT leadership team to create a strong pitch and go to the major industry players – the “Big Three” and others – to show them what they have done and solicit funding. A strong recommendation from this individual was to “team up” and not try to go it alone. They wanted to see MCC work along side WSU and other community colleges to create a compelling case for resources, and they felt this type of approach would be more successful than a solo proposition from CAAT at MCC.
CONCLUSIONS AND RECOMMENDATIONS

This final section presents conclusions recommendations pertaining to the accomplishments of CAAT for FY2017 but also relative to the entire period of the CAAT’s existence.

Conclusions

Based on data collected by the TPE over the entirety of the grant, the CAAT has accomplished a great deal for its primary partners, Macomb Community College and Wayne State University, but also for many other stakeholders, constituencies, and user groups. Evidence from multiple sources demonstrate that the CAAT has established itself as an entity with a solid reputation for up-to-date information about AAT, especially in the education sector (K-12 through higher education), and in strengthening partnerships with K-12 education, community colleges and universities in Michigan and well beyond the Michigan state lines, as evidenced by seed funding projects that are conducted out of the state of Michigan (e.g., Jackson State, Springfield Tech and UAB). In addition, on-going activities such as seed funding and the CAAT annual conference have grown in success, based not only on the strong positive perceptions of various stakeholders, but on the qualitative and quantitative data gathered and reported by this TPE. In addition, the TPE has found the analytics supplied by the CAAT leadership team concerning the website and social media have continued to grow and demonstrate an ever larger impact of CAAT’s electronic newsletters, curriculum materials, and other information have a growing audience on both the domestic and international levels.

Recommendations

Three recommendations are given to assist the CAAT team in continuing to advance and grow its impact on the field, including engaging in sustainability activities.

- Reflecting on and documenting the CAAT’s accomplishments for the full scope of the Center’s existence is needed now. While there is an annual “taking stock” activity that goes on, it would be extremely valuable for the CAAT team to engage in a comprehensive self-assessment process to capture concrete examples of outcomes that would or could not have been achieved without the NSF ATE investment.

- Moving forward, the CAAT team at MCC needs to decide whether it desires to pursue a sustainability plan. Whether a new proposal will be developed for NSF ATE or another government source, or a strategy to pursue private sector support is pursued. In either case, it will be necessary to build a strong foundational business case and consider the value proposition that will garner support from funders. Having done good work in the past may not be sufficiently compelling to secure new money; so thinking deeply about what should be done in the future is needed now more than ever.

- Should the CAAT decide that it will not pursue a major funding-raising campaign (and I have no idea if this may or may not happen), it will be very important to ensure that all of the valuable work that has been done is integrated into the fabric of MCC and it’s partnership with WSU. Too much meritorious work has been accomplished to see it vanish without adequate attention to detail. To this end, a strong sustainability plan should be developed to ensure that all the work products and processes that have merit have an opportunity to live on.
APPENDIX
Flowchart Showing Evaluation Roles and Responsibilities of CAAT and Third Party Evaluator

CAAT Leadership

Reach Consensus on Evaluation Methods & Evaluator

CAAT Third Party Evaluator

Collect Data

Analyze Data

Report Results