

Semi-Annual Progress Report for University Transportation Centers



MID-AMERICA
TRANSPORTATION CENTER

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L.R. Rilett, Director, Mid-America Transportation Center

1. ACCOMPLISHMENTS

What are the major goals of the program?

The major goals of the Mid-America Transportation Center (MATC), which were outlined in the MATC proposal, are indicated in the table below. Activities related to research, education, technology transfer, and USDOT requirements are well underway. Please refer to the table below for an update on the status of each activity.

Table 1: Status of MATC’s Research, Educational, and Technology Transfer Activities and Reporting Requirements

Research Activities:	Status	Percent Completed for Year 1, 2, 3
Call for Problem Statements	On Schedule	100%
Request for Proposals	On Schedule	100%
Final Proposal Ranking & Selection	On Schedule	100%
Data Management Plan (DMP) - Overarching Plan for MATC	On Schedule	100%
Collect DMPs from PIs for Individual Research Projects	On Schedule	100%
Collect ORCIDiDs from all MATC Researchers	On Schedule	100%
Submit Project Descriptions to TRB's RiP Database	On Schedule	100%
Submit Final Research Reports	On Schedule	100%
Collect & Store Final Data in UNL Data Repository	On Schedule	100%
Education and Outreach Activities:		
Grad/Undergrad MATC Course Development & Implementation	Forthcoming	0%
MATC Undergraduate Summer Internship Program	On Schedule	100%
MATC Scholars Program	On Schedule	100%
MATC/UTC Outstanding Student of the Year	On Schedule	100%
MATC Roads, Rails, and Race Cars After-School Program	On Schedule	100%
MATC/NCIA Sovereign Native Youth STEM Leadership Academy	On Schedule	100%
MATC Summer Institute	Forthcoming	0%
MATC Research Experience for Undergraduates (REU) Program	On Schedule	100%
MATC Joint Activities with Student Chapters	On Schedule	100%
Technology Transfer Activities:		
Technology Transfer Plan – Overarching Plan for MATC (Approved October 19, 2018)	On Schedule	100%

Collect Tech Transfer Plans from PIs for Individual Research Projects	On Schedule	0%
Technology Transfer Tech Briefs, Webinars & Presentations on Research Results	On Schedule	100%
Roadside Safety Short Course (UNL)	On Schedule	100%
Roadside Safety Workshop (UNL)	On Schedule	100%
Traffic Safety Classes (KU)	On Schedule	100%
Structural Condition Assessment Short Course (MS&T)	Forthcoming	0%
LTAP Workshop	On Schedule	100%
USDOT OST-R Reporting Requirements:		
Federal Financial Reports	On Schedule	100%
Post Research Project Descriptions on MATC Website	On Schedule	100%
UTC Program Progress Performance Reports (Semi-annually)	On Schedule	100%
Annual Performance Indicators Reports	On Schedule	100%
Additional USDOT OST-R Requirements:		
Establish and Maintain Center Website	On Schedule	100%
Directory of Key Center Personnel	On Schedule	100%
Attendance at UTC Grantees' Meetings	On Schedule	100%

What was accomplished under these goals?

Research Activities:

Several research activities were accomplished during the reporting period of October 1, 2018 – March 31, 2019. All external reviews were collected for MATC year 2 research proposals. The MATC Executive Committee approved funding for 22 projects, 18 of which are multi-phase projects and a continuation of research activities completed in year 1. At the start of May, the MATC Director will reach out to the Associate Directors to determine an appropriate deadline for year 3 proposals at each participating university.

MATC staff created Data Management Plan (DMP) templates, in accordance with USDOT requirements and the center’s overarching plan, to assist Principal Investigators with completing a DMP for their individual research project. MATC is in the process of collecting these plans. It is anticipated that all DMPs will be collected by May 31, 2019.

Throughout the reporting period, Principal Investigators submitted quarterly reports detailing the progress, activities, and outcomes of their individual research projects. MATC staff maintained project records on the Transportation Research Board’s Research in Progress (RiP) database and on MATC’s online database at: http://matc.unl.edu/research/research_search.php. Links to the RiP database and MATC’s website for the research projects that were approved during this reporting period are provided in the table below.

Table 2: MATC Website and RiP Links to Research Project Descriptions

University	Project Title	Principal Investigator	Link to MATC Website	RiP Access
Missouri University of Science and Technology	Repair of Corroded Steel H-Piles Using High Performance Material – Phase II (UHPC and FRP Repair Sections)	Mohamed El Gawady	http://matc.unl.edu/research/research_project.php?researchID=561	https://rip.trb.org/View/1582155
Missouri University of Science and Technology	Crash Prediction and Avoidance by Identifying and Evaluating Risk Factors from Onboard Cameras	Ruwen Qin	http://matc.unl.edu/research/research_project.php?researchID=560	https://rip.trb.org/View/1582162
Missouri University of Science and Technology	Performance of Earthquake-Damaged Reinforced Concrete Bridges with Repaired Columns	Lesley Sneed	http://matc.unl.edu/research/research_project.php?researchID=558	https://rip.trb.org/View/1582165
Missouri University of Science and Technology	Sensor-assisted Condition Evaluation of Steel and Prestressed Concrete Girder Bridges Subjected to Fire – Phase II	Genda Chen	http://matc.unl.edu/research/research_project.php?researchID=563	https://rip.trb.org/View/1582119
Missouri University of Science and Technology	SMART Shear Keys for Multi-Hazards Mitigation of Diaphragm-Free Girder Bridges – Phase II	Genda Chen	http://matc.unl.edu/research/research_project.php?researchID=564	https://rip.trb.org/View/1582120
Missouri University of Science and Technology	Predictive Deep Learning for Flood Evaluation Planning and Routing	Suzanna Long	http://matc.unl.edu/research/research_project.php?researchID=553	https://rip.trb.org/View/1581011
Missouri University of Science and Technology	Investigation of Wind Effects on Bridges Induced by Tornadoes for Tornado-Resistance Design – Phase I	Guirong (Grace) Yan	http://matc.unl.edu/research/research_project.php?researchID=559	https://rip.trb.org/View/1582154

Missouri University of Science and Technology	3D Printed FRP-Concrete-Steel Composite Hollow Core Bridge Columns	Chenglin Wu	http://matc.unl.edu/research/research_project.php?researchID=550	https://rip.trb.org/View/1581012
Missouri University of Science and Technology	MoDOT Autonomous Leader-Follower TMA System: Development of Autonomous Trucks Operation Guidelines and Driver Training Process	Xianbiao Hu	http://matc.unl.edu/research/research_project.php?researchID=551	https://rip.trb.org/View/1581013
University of Kansas	Automated Bridge Inspection using Digital Image Correlation Phase II – Application of Digital Image Correlation Techniques for In-Service Inspection Conditions	William Collins	http://matc.unl.edu/research/research_project.php?researchID=570	https://rip.trb.org/View/1584673
University of Kansas	LIDAR, Electric Bikes, and Transportation Safety – Phase II	Christopher Depcik	http://matc.unl.edu/research/research_project.php?researchID=549	https://rip.trb.org/View/1582010
University of Kansas	Modeling Driver Behavior and Driver Aggressiveness Using Biobehavioral Methods – Phase II	Alexandra Kondyli	http://matc.unl.edu/research/research_project.php?researchID=557	https://rip.trb.org/View/1582163
University of Kansas Medical Center	Assessing and Improving the Cognitive and Visual Driving Fitness of CDL Drivers – Phase II	Shelley Bhattacharya	http://matc.unl.edu/research/research_project.php?researchID=567	https://rip.trb.org/View/1582364
University of Iowa	Development of New Design Guidelines for Protection Against Erosion at Bridge Abutments and Embankments – Phase II	George Constantinescu	http://matc.unl.edu/research/research_project.php?researchID=552	https://rip.trb.org/View/1581040
University of Iowa	Infrastructure Inspection During and After Unexpected Events – Phase II	Salam Rahmatalla	http://matc.unl.edu/research/research_project.php?researchID=556	https://rip.trb.org/View/1582164

University of Iowa	Transportation Planning with Floods – Phase II	Ann Melissa Campbell	http://matc.unl.edu/research/research_project.php?researchID=565	https://rip.trb.org/View/1582122
University of Iowa	Reducing Flammability for Bakken Crude Oil for Train Transport – Phase II	Albert Ratner	http://matc.unl.edu/research/research_project.php?researchID=554	https://rip.trb.org/View/1581014
University of Iowa	Real-time Flood Forecasting for River Crossings – Phase II	Witold Krajewski	http://matc.unl.edu/research/research_project.php?researchID=569	https://rip.trb.org/View/1582227
University of Nebraska Omaha & University of Nebraska Medical Center	Real-Time Emergency Communication System for HazMat Incidents (REaCH) – Phase II	Ann Fruhling	http://matc.unl.edu/research/research_project.php?researchID=555	https://rip.trb.org/View/1582161
University of Nebraska-Lincoln	Virtual Barriers for Mitigating and Preventing Run-off Road Crashes – Phase II	Cody Stolle	http://matc.unl.edu/research/research_project.php?researchID=566	https://rip.trb.org/View/1582121
University of Nebraska-Lincoln	Investigation of a MASH Test Level 6, Cost-Effective, Barrier System for Containing Heavy Tractor Tank-Trailer Vehicles and Mitigating Catastrophic Crash Event – Phase II	Ronald Faller	http://matc.unl.edu/research/research_project.php?researchID=562	https://rip.trb.org/View/1582125
University of Nebraska-Lincoln	Protecting Critical Infrastructure Against Impact from Commercial Vehicles – Phase II	Daniel Linzell	http://matc.unl.edu/research/research_project.php?researchID=568	https://rip.trb.org/View/1583347
University of Nebraska-Lincoln	Evaluation of Concrete Models in LS-DYNA to Develop a MASH Test Level (TL-6) Barrier System – Phase I	Yong-Rak Kim	http://matc.unl.edu/research/research_project.php?researchID=548	https://rip.trb.org/View/1562291

Education and Outreach Activities:

MATC has implemented several educational outreach programs in support of USDOT's Strategic Plan and the center's mission to increase the number of students from underrepresented groups in STEM education and transportation-related careers. Descriptions of each educational program and the activities that took place during October 1, 2019 – March 31, 2019 are detailed below.

MATC After-School Program - Road, Rails, and Race Cars (RRRC)

MATC's after-school program combines the talents of 4-12th grade teachers, engineering graduate and undergraduate college and university student mentors, and professional and industry partners to educate the diverse leaders of tomorrow about STEM principles. Each participating school offers the club for an hour every week. Mentors present on an engineering or transportation-related topic and lead students in an interactive activity that encompasses the concepts of the lesson. Examples of activities include constructing bridges and conducting strength tests, creating towers that can withstand simulated earthquakes, and building race cars powered by potential energy stored in a rubber band.

During the reporting period, RRRC was implemented at a total of 10 locations in 3 cities across Nebraska. Total attendance for the fall and spring programming of the MATC RRRC program was 690 students.

Fall 2019 Programming

The fall semester portion of the 2018-2019 academic year of RRRC was implemented at ten (10) sites from October to December, 2018: Culler Middle School, Dawes Middle School, Goodrich Middle School, Lefler Middle School, Mickle Middle School, Park Middle School, and Maxey Elementary School. All of these sites are located in Lincoln, NE. Additionally, RRRC was implemented at three sites outside of Lincoln: Omaha Nation Public School in Macy, NE; Santee Community School in Santee, NE; and Winnebago Public School, in Winnebago, NE. In the period from October 31, 2018 to December 18, 2018 there were a total of forty-seven (47) implementation dates with total attendance being 335 by 128 unique students. The curriculum included activities under the topics of designing for disasters, aeronautical engineering, structural engineering, mechanical engineering, civil engineering, energy, and magnets and physics.

Spring 2019 Programming

The spring semester portion of the 2018-2019 academic year of RRRC is currently implemented at nine (9) sites from January to April 2019: Culler Middle School, Dawes Middle School, Goodrich Middle School, Lefler Middle School, Mickle Middle School, Park Middle School, and Maxey Elementary School. All of these sites are located in Lincoln, NE. Additionally, RRRC is implemented at three sites outside of Lincoln: Omaha Nation Public School in Macy, NE; Santee Community School in Santee, NE; and Winnebago Public School, in Winnebago, NE. In the period from January 16, 2019 to March 31, 2019 there were a total of fifty (50) implementation dates with total attendance being 355 by 112 unique students. The curriculum included activities under the topics of civil engineering, the six simple machines, and designing for disasters.

Additional RRRC tasks completed during the 2018-2019 academic year included club promotion and recruitment at Culler Middle School, developing new curriculum for both semesters, daily meetings with mentors to develop strategies and track progress of the lessons and activities, and communication with

mentors, teachers, CLC staff, and MATC staff. RRRRC expanded its implementation to Santee Community School during this period. Recruitment efforts were made in each school to promote the program. A partnership with Nebraska Indian Community College (NICC) was made during the Fall 2018 semester to train an NICC intern to assist the program.

For the Academic Year 2017-2018 RRRRC employed: one (1) Education and Outreach Coordinator, nine (9) on-site teachers, and eight (8) undergraduate engineering student mentors. On a daily average, each school had one (1) Education and Outreach Coordinator, one (1) teacher, and three (3) undergraduate engineering student mentors.

MATC Scholars Program

The MATC Scholars Program is a three-day conference designed to promote graduate study among underrepresented groups and women in STEM fields, which is accomplished through targeted seminars, workshops, and networking opportunities.

The sixth MATC Scholars Program took place October 10-12, 2018 and focused on encouraging and assisting Native American undergraduates with transitioning from 2-year tribal and community colleges to 4-year degree granting universities. The curriculum was developed by Native American faculty and MATC staff. The program was attended by 15 students from Nebraska Indian Community College and 23 leaders from University of Nebraska-Lincoln, Nebraska Commission on Indian Affairs, University of Montana, University of South Dakota, Indianz.com, and Vision Maker Media. More information about the 2018 Scholars Program can be found at: <http://matc.unl.edu/education/scholars-program2018.php>.

The seventh iteration of the MATC Scholars Program is scheduled to take place on October 16-18, 2019. The program will focus on the need of Native American undergraduate students. MATC will recruit students from Nebraska Indian Community College, Little Priest Tribal College, and Haskell Indian Nations University.

MATC Intern Program

The MATC Intern Program partners with private companies, local government, and academia to provide undergraduate students with paid summer internship opportunities in the transportation and engineering fields. During this 12-week program, students gain hands-on experience in their area of interest under the mentorship of a professional. Students work 40 hrs/wk while experiencing the day-to-day tasks and responsibilities of their desired career. The program culminates in a written paper and presentation detailing the student's internship experience.

The 2019 MATC Intern Program will take place May 20-August 9. Participating sponsors are currently confirming the number of interns they want for the summer, reviewing the application materials, and conducting interviews with the candidates based on the recommendations of MATC staff. Internships will be finalized in the next week or two. Twelve to eighteen students will participate in this year's program and gain experience at one of seven sponsoring organizations: City of Lincoln, City of Omaha, Nebraska Department of Transportation, Metropolitan Area Planning Agency, JEO Consulting Group, Iteris, and Felsburg Holt & Ullevig.

The 2019 program will kick off with an orientation and luncheon on Friday, May 17. The Assistant Director of Career Services at the University of Nebraska-Lincoln will speak to the interns about office

etiquette, the importance of networking, and how to maximize their internship experience. A former MATC intern and current Traffic Engineer at the City of Omaha will share his advice and professional journey with the interns. Halfway through the summer, the interns will take a daylong technical tour of organizations in the public and private sector of transportation engineering to gain a sense of the differences and help interns narrow their focus. The program will culminate in a closing ceremony on August 9. Interns will present what they accomplished and learned over the summer to supervisors and fellow interns.

MATC will start connecting with sponsors and recruiting interns in the fall of 2019 for the 2020 summer program.

NCIA/MATC Sovereign Native Youth STEM Leadership Academy

The Sovereign Native Youth STEM Leadership Academy is a six-day summer camp that provides Native American high school students with the leadership skills to positively impact their tribal communities and shape their futures. The academy, held on the University of Nebraska-Lincoln campus, offers a broad range of interactive, hands-on activities that expose students to science, technology, engineering, and math (STEM) and transportation-related opportunities after high school. The curriculum is developed and implemented by Native American faculty, community leaders, students, and MATC staff.

The 2019 program will take place June 2-7. Fourteen students are registered to attend, and MATC will continue accepting applications until May 15.

MATC Research Experience for Undergraduates (REU)

MATC has selected one Native American undergraduate civil engineering student to participate in the 2019 MATC REU program. This student will work on a transportation-related research project over the course of the summer under the supervision of MATC Director Dr. Laurence Rilett.

How have the results been disseminated?

All MATC activities are in the planning or implementation phases. News of MATC's activities have primarily been shared on our social media and website. MATC released a newsletter in March 2019 to share recent research, education, and technology transfer activities with affiliates and sponsors. Volume 10, issue 1 is accessible on the MATC website at: <http://matc.unl.edu/media/newsletters.php>. For MATC research projects that ended during the reporting period, final reports were collected and posted on MATC's website and sent to the libraries, as required by the *Grant Deliverables and Reporting Requirements for 2016 and 2018 for University Transportation Centers*.

Since the last reporting period, MATC hosted three additional webinars as part of the MATC Fall Webinar Series. On November 28, 2018, Jason Cowin discussed his work with the Transportation Engineering Agency-Military Surface Deployment and Distribution Command. Thirty-three students and faculty members attended the event. Three additional attendees connected via livestream. Dwight Clark, AREMA past president and retired Union Pacific Railroad General Director of Engineering Technology shared emerging technologies in the railroad industry with 36 (32 in person and 4 online) MATC affiliates on December 7, 2018. Dr. Lilian Rezende, a Fulbright scholar from the Federal University of Goiás-Brazil, presented her collaborative research at the University of Nebraska-Lincoln's Nebraska Transportation Center on December 19, 2018, to 14 in person and 2 online attendees. Recordings from

the MATC Fall Webinar Series were uploaded to the MATC YouTube channel and available on the MATC website at: <http://matc.unl.edu/webinarseries.php>.

On April 29, 2019, MATC researchers from the University of Kansas Medical Center will travel to the University of Nebraska-Lincoln to give a presentation on their ongoing research project about assessing and improving the cognitive and visual driving fitness of older drivers. The presentation will be shared via livestream and recorded for those who are unable to attend in person.

MATC is currently reaching out to affiliated researchers to participate in the upcoming MATC Fall Webinar Series. Partner institutions and interested community members will be able to participate live via Zoom with audio and video feed and ask the speakers' questions via chat. All of the presentations will be posted online via SlideShare. The speakers will be recorded and shared on MATC's YouTube channel and website.

What do you plan to do during the next reporting period to accomplish the goals?

Implementation of the activities outlined in Table 1 for all research, education, technology transfer, and USDOT requirements will continue toward completion on-schedule.

2. PARTICIPANTS & COLLABORATING ORGANIZATIONS

What organizations have been involved as partners?

During the reporting period, the Mid-America Transportation Center worked with 60 unique organizations to develop and implement research, education, and technology transfer activities. Each organization and its location are listed in the table below, along with information describing the specific area or capacity in which the respective organization is committed to supporting the center.

Table 3: MATC Partners and Type of Collaboration

MATC Program Affiliation	Organization Name	City	State	Financial Support	In-Kind Support	Contribution Facilities	Collaborative Research	Personnel Exchanges
Intern Program	City of Lincoln Public Works	Lincoln	NE			X		X
Intern Program	City of Omaha Public Works	Omaha	NE			X		X
Intern Program	Metropolitan Area Planning Agency	Omaha	NE			X		X
Intern Program	JEO Consulting Group Inc.	Lincoln	NE			X		X
Intern Program	Nebraska Department of Transportation	Lincoln	NE			X		X
Intern Program	Iteris, Inc.	Lincoln	NE			X		X

After-School Program	Culler Middle School	Lincoln	NE		X	X		
After-School Program	Lefler Middle School	Lincoln	NE		X	X		
After-School Program	Mickle Middle School	Lincoln	NE		X	X		
After-School Program	Goodrich Middle School	Lincoln	NE		X	X		
After-School Program	Dawes Middle School	Lincoln	NE		X	X		
After-School Program	Park Middle School	Lincoln	NE		X	X		
After-School Program	Maxey Elementary School	Lincoln	NE		X	X		
After-School Program	Umó ^o ho ⁿ Nation Public School	Macy	NE	X	X	X		X
After-School Program	Winnebago Public School	Winnebago	NE	X	X	X		X
Summer Academy	Santee Community School	Santee	NE	X	X	X		X
After-School Program	Community Learning Center	Lincoln	NE				X	
After-School Program	State Farm	Bloomington	IL	X				
Scholars Program; Summer Academy; After-School Program	Nebraska Indian Community College	Macy	NE	X			X	X
Scholars Program	University of Montana	Missoula	MT					X
Scholars Program	Indianz.com	Lincoln	NE					X
Scholars Program	University of South Dakota	Vermillion	SD					X
Scholars Program	Vision Maker Media	Lincoln	NE					X

All Programs	University of Nebraska-Lincoln	Lincoln	NE	X	X	X	X	X
Scholars Program	Nebraska Commission on Indian Affairs	Lincoln	NE				X	
Scholars Program; Intern Program	Union Pacific	Omaha	NE	X		X		
Scholars Program	Nebraska State Legislature	Lincoln	NE	X		X		X
MATC Research	University of Kansas Medical Center Research Institute	Kansas City	KS	X				
MATC Research	Iowa Flood Center	Iowa City	IA			X	X	
MATC Research	University of Florida	Gainesville	FL		X	X	X	X
MATC Research	LBT, Inc. (Liquid Bulk and Tank, Inc.)	Omaha	NE		X	X		
MATC Research	Missouri Department of Transportation	Jefferson City	MO	X	X	X	X	
MATC Research	Santa Catarina State University	Itacorubi, Florianópolis	Brazil		X		X	X
All Programs	Nebraska Transportation Center	Lincoln	NE		X	X	X	
After-School Program	Lincoln Public School Board	Lincoln	NE	X				
MATC Research	National Institute of Standards and Technology (NIST)	Gaithersburg	MD			X	X	
MATC Research	Marshall University	Marshalltown	WV		X		X	
MATC Research	Nebraska Trucking Association	Lincoln	NE				X	
MATC Research	Biomedical Informatics, University of	Omaha	NE				X	

	Nebraska Omaha							
MATC Research	U.S. Geological Survey	Rolla	MO		X	X	X	
MATC Research	National Oceanic and Atmospheric Administration /National Weather Service	Springfield	MO		X	X	X	
MATC Research	United States Army Corps of Engineers	Kansas City	MO		X	X	X	
MATC Research	California Department of Transportation	Sacramento	CA	X				
MATC Research	Utah Department of Transportation	Taylorsville	UT	X				
MATC Research	Wyoming Department of Transportation	Cheyenne	WY	X				
MATC Research	Kansas Department of Transportation	Kansas City	KS	X				
MATC Research	South Dakota Department of Transportation	Pierre	SD	X				
MATC Research	Minnesota Department of Transportation	St. Paul	MN	X				
MATC Research	Iowa Department of Transportation	Ames	IA	X				
MATC Research	Wisconsin Department of Transportation	Madison	WI	X				
MATC Research	Illinois Department of Transportation	Springfield	IL	X				
MATC Research	Indiana Department of Transportation	Indianapolis	IN	X				
MATC Research	Ohio Department of Transportation	Columbus	OH	X				
MATC Research	Kentucky Department of Transportation	Frankfort	KY	X				

MATC Research	North Carolina Department of Transportation	Raleigh	NC	X				
MATC Research	South Carolina Department of Transportation	Columbia	SC	X				
MATC Research	Virginia Department of Transportation	Richmond	VA	X				
MATC Research	Florida Department of Transportation	Tallahassee	FL	X				
MATC Research	New Jersey Department of Transportation	Trenton	NJ	X				
Summer Academy	Claire M. Hubbard Foundation	Omaha	NE	X				

Have other collaborators or contacts been involved?

During the period of October 1, 2018 – March 31, 2019, MATC researchers collaborated with Professor Bruce William Melville from the Department of Civil and Environmental Engineering at the University of Auckland in New Zealand.

3. OUTPUTS

In the center’s overarching Technology Transfer Plan, MATC identified three performance measures and three corresponding goals related to the outputs, or products, resulting from research and development activities. Table 5 contains a description of each performance measure, the associated goal, and the center total for the reporting period of October 1, 2018 – March 31, 2019.

Table 5: Performance Measures, Goals, and Totals for MATC Outputs

	Performance Measure	Description	Goal	Center Total for Oct. 1, 2018 – Mar. 31, 2019
Output 1	Products and Processes	The quantity of new or improved processes, practices, technologies, software, training aids, or other tangible products.	Thirty (30) new products and processes by the end of the grant period.	Zero (0) MATC is on schedule to develop new and improved processes, practices, technologies, and other products by the end of the grant cycle.
Output 2	Technical Communications	The number of technical communications (peer reviewed	Fifteen (15) technical communications	Twenty-one (21) During the reporting period, 16 final reports and 5 peer

		journal papers, peer reviewed conference papers, final reports, etc.)	each year of the grant period.	reviewed journal papers and conference papers were published.
Output 3	Outreach Activities	The number of outreach activities (webinars, social media, workshops, newsletters, and presentations, etc.)	Fifteen (15) outreach activities for each year of the grant period.	Twenty-four (24) During the reporting period, 1 newsletter was released, 7 presentations and 3 webinars occurred, 5 workshops and short courses were held, and 8 websites and social media platforms were utilized.

Publications, conference papers, and presentations:

Journal Publications

1. Singh, G., Esmaeilpour, E., & Ratner, A. (2018). The Effect of Acetylene Black on Droplet Combustion and Flame Regime of Petrodiesel and Soy Biodiesel. *Fuel*. Yes, acknowledgement of Federal support.
2. Singh G., Esmaeilpour M., & Ratner A. (2019). The Effect of Acetylene Black on Droplet Combustion and Flame Regime of Petrodiesel and Soy Biodiesel. *Fuel*, Volume 246, 2019, Pages 108-116. Yes, acknowledgement of Federal support.

Presentations

1. Fendrick, S. & Fruhling, A. Design for Safety: Decreasing First Responder Health Risks Through Real-Time Bio-Sensor Alerts. Poster presentation at the University of Nebraska Omaha Research Fair, March 1, 2019.
2. Nabwala, M. Nsengiumva, G. & Kim, YR. Assessing Impact and Blast Resilience of Polymer Coated Cementitious Materials. Poster presentation for the UCARE Undergraduate Research Program at the University of Nebraska-Lincoln, 2019.
3. Vikas, S. A Comparison Study on Visualization Design Preferences to Monitor First Responders' Health. Thesis Presentation, March, 2019.
4. Campbell, A. A Generalized Routing and Accessibility Analysis System for Flooding: Iowa Testbed. INFORMS Conference, Phoenix, Arizona, November 4, 2018.
5. Kondyli, A. Validating the Task-Capability Extension to the Intelligent Driver Model (IDM) Using Driving Simulator Data. Transportation Research Board Annual Meeting, Washington, D.C., January 2019.
6. Singh, G. Esmaeilpour, M., & Ratner, A. Effect of Polymer Addition on Burning Rate of Pennsylvania Crude. 11th US National Combustion Meeting, December 2018. Yes,

acknowledgement of Federal support.

7. Whitfield, D. Investigation of a Tractor-Tank Trailer Roadside Containment Barrier. Presentation for master's thesis defense, November 16, 2018.

Conference Papers

1. Moniruzzaman, M., Yin, Z., & Qin, R. Spatial Attention Mechanism for Weakly Supervised Fire and Traffic Accident Scene Classification. In proceedings of the 5th IEEE International Conference on Smart Computing (SMARTCOMP), 2019.
2. Yuan, X. & Chen, G. SMART Shear Key and its Mechanism for Earthquake and Tsunami Mitigation. In proceedings of the 7th World Conference on Structural Control and Monitoring, Qingdao, China, July 22-25, 2018.
3. Godse, P. Xue, J., Long, S.K., & Qin, R. Data Analysis for Identifying High Chance Scenarios of Hazardous Material Highway Transportation Incidents. In proceedings of American Society for Engineering Management 2018 International Annual Conference, Coeur d'Alene, Idaho, October 2018. Yes, acknowledgement of Federal support.

Website(s) or other Internet site(s):

MATC maintains 5 online sites that distribute information utilizing the internet. Links to each site, as well as report period information, can be found below.

MATC Website

By clicking the following link, <http://matc.unl.edu>, you will be directed to MATC's website. Below is highlighted information from Google Analytics about the website's traffic from October 1, 2018 – March 31, 2019. By understanding and capitalizing this knowledge, we are able to make our homepage engaging, relevant, and resourceful to our viewers. Since our last progress report, the average duration of users' visits climbed from 22 seconds to 1 minute and 13 seconds.

Visits: 14,484	Page views: 35,633	Pages per visit: 2.26	Average visit duration: 01:13
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SlideShare

The top 5 countries that viewed our Slideshare presentations during the reporting period are: the United States, Germany, Netherlands, India, and Canada. Below is a snapshot of MATC's SlideShare activity and the link to view the page. <https://www.slideshare.net/matcRegion7UTC/presentations/>. MATC's SlideShare views have increased by 291 since the last progress report.

Total Views: 1,616	New Uploads: 3	Downloads: 13	Favorites: 2
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Facebook

The MATC Facebook page has experienced an increase of 313 total page likes since the last reporting period. Metrics for the MATC Facebook page can be viewed below, and the page can be accessed by clicking on the following link. MATC's reach increased by 2,388 since the last reporting period. <https://www.facebook.com/pages/Mid-America-Transportation-Center-MATC/141238439284182>.



Views: 257	Total Page Likes: 365	Reach: 5,512	Total Countries (of Followers): 36	Total Languages (of Followers): 15
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Twitter

MATC’s Twitter handle is @MATCNews. The page can be viewed by clicking the following link: <https://twitter.com/MATCNews>. The highlighted numbers for MATC’s Twitter activity can be seen below. MATC’s tweet impressions increased by 4,788 since the last reporting period.

New Followers: 5	Tweet Impressions: 22,048	Profile Visits: 199	Tweets: 7
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YouTube

MATC’s YouTube feed can be viewed by clicking the following link: http://www.youtube.com/user/midamericatrans?feature=results_main.

New Videos: 4	Views: 1,109	Minutes Watched: 3,058
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Additional Partner Websites

Several MATC Principal Investigators created websites to share information about their research projects. The links to these websites are provided in Table 6 along with the corresponding MATC project.

Table 6: Websites for Individual MATC Research Projects Created by Principal Investigators

Project Title	Principal Investigator	Website Link
Assessing and Improving the Cognitive and Visual Driving Fitness of CDL Drivers	Dr. Shelley Bhattacharya	http://www.kumc.edu/landon-center-on-aging/research/truck-safety-study.html
Transportation Planning for Floods	Dr. Ann Melissa Campbell	http://iihr-vl01.iihr.uiowa.edu/dev/pchen18/
LIDAR, Electric Bikes, and Transportation Safety	Dr. Christopher Depcik	http://depcik.faculty.ku.edu/ebike

4. OUTCOMES

MATC identified three performance measures and three corresponding goals related to program outcomes in the center’s Technology Transfer Plan. Table 7 contains a description of each performance measure, the associated goal, and the center total for the reporting period of October 1, 2018 – March 31, 2019.

Table 7: Performance Measures, Goals, and Totals for MATC Outcomes

	Performance Measure	Description	Goal	Center Total for Oct. 1, 2018 – Mar. 31, 2019
Outcome 1	Commercialized Products	The quantity of invention	Ten (10) products that are	Zero (0)

		disclosures, patent disclosures, patents issued, cooperative research and/or user agreements, and new business entities created.	commercialized or in the commercialization process by end of grant period.	MATC is on schedule to develop commercialized products by the end of the grant period.
Outcome 2	Output Adoption	The number of changes made to the transportation system (including regulations, legislation, standard plans, technical guides, or policy) resulting from MATC research.	Ten (10) that have been adopted or in the process of adoption by the end of grant period.	Zero (0) MATC is on schedule to implement changes to the transportation system by the end of the grant period.
Outcome 3	Product Utilization	The number of MATC products utilized (including citations, references, views, report downloads, and report requests).	Forty (40) by the end of the grant period.	Twenty-one (21) 8 MATC-related project citations were utilized and 13 Slideshare downloads occurred during the reporting period. MATC products are on schedule to be utilized by the end of the grant period.

5. IMPACTS

MATC identified three performance measures and three corresponding goals related to program impacts in the center’s Technology Transfer Plan. Table 8 contains a description of each performance measure, the associated goal, and the center total for the reporting period of October 1, 2018 – March 31, 2019.

Table 8: Performance Measures, Goals, and Totals for MATC Impacts

	Performance Measure	Description	Goal	Center Total for Oct. 1, 2018 – Mar. 31, 2019
Impact 1	Public Stakeholder Participation	Number of public organizations serving as	Five (5) public sector external partners	Fifty-one (51)

		sponsors of research and T2 programs, such as the Summer Internship Program, Scholars Program, and RRRC After-School Program.	providing support to MATC activities for each year of the grant period.	MATC partnered with 51 public organizations on research, education, and technology transfer activities. See Table 3 beginning on p. 10 for the complete list.
Impact 2	Private Stakeholder Participation	Number of private organizations serving as sponsors of various research and T2 programs, such as the Summer Internship Program, Scholars Program, and RRRC After-School Program.	Five (5) private sector external partners providing support to MATC activities for each year of the grant period.	Nine (9) MATC partnered with 9 private organizations on research, education, and technology transfer activities. See Table 3 beginning on p. 10 for the complete list.
Impact 3	Transportation Professional Participation	Number of transportation professionals who participate in MATC T2 activities.	One hundred (100) transportation professionals for each year of grant period.	Ninety-five (95) Ninety-five transportation professionals participated in MATC research, education, and technology transfer activities during the reporting period.

What is the impact on the effectiveness of the transportation system?

Ongoing MATC research projects will have a wide variety of impacts on the effectiveness of the transportation system. For example, in a project led at the University of Nebraska-Lincoln, MATC researchers are developing a barrier system for containing heavy tractor tank-trailer vehicles and mitigating catastrophic crash events. This barrier could be installed on roadsides throughout the country and world, thus increasing the safety of the roadways.

What is the impact on the adoption of new practices, or instances where research outcomes have led to the initiation of a start-up company?

There is nothing to report yet on the center's impact on the adoption of new practices where research outcomes have led to the initiation of a start-up company. Many research projects are expected to have an impact when research projects move past completion. For example, one project led by MATC researchers at the University of Kansas are developing LIDAR systems capable of mapping 360 degrees of their surroundings and distinguishing between harmless debris or trash and small hazards like traffic cones. A code is created using an open source framework which promotes widespread use and commercialization of the software and, by extension, the hardware.

What is the impact on the body of scientific knowledge?

MATC's current and ongoing transportation research will have a wide variety of safety-related impacts on the current body of scientific knowledge. For example, researchers at the Missouri University of Science and Technology will produce a component of a smart safety enhancement system that improves the responsiveness and effectiveness of emergency responders and hospitals related to hazardous material transportation incidents. At the University of Kansas, researchers hope to establish a more accurate traffic simulation model that incorporates an aspect of human bio-behavioral factors and driver classification. This will provide a platform to refine existing traffic simulation models and provide key insights to how behavior affects traffic and performance. Improving the prediction capabilities of car-following models can have a significant positive impact on traffic mitigation and planning strategies, as prediction models can be refined to a greater accuracy.

What is the impact on transportation workforce development?

MATC's research and education activities play a vital role in inspiring and preparing students to become future professionals of the transportation workforce. The MATC Scholars Program, STEM Academy, Intern Program, and After-School Program are designed to increase access and retain students from underrepresented groups in STEM and transportation-related degree granting programs and careers. MATC research projects provide graduate students with the opportunity to gain hands-on research experience in the field of transportation. The interdisciplinary projects completed during program activities bolstered students' conceptual and practical skills in STEM subjects. Students were encouraged to reconfigure their expectations of STEM subjects and perceived barriers and extend their interest beyond classroom experiences.

6. CHANGES/PROBLEMS

Nothing to report.

7. SPECIAL REPORTING REQUIREMENTS

Nothing to report.